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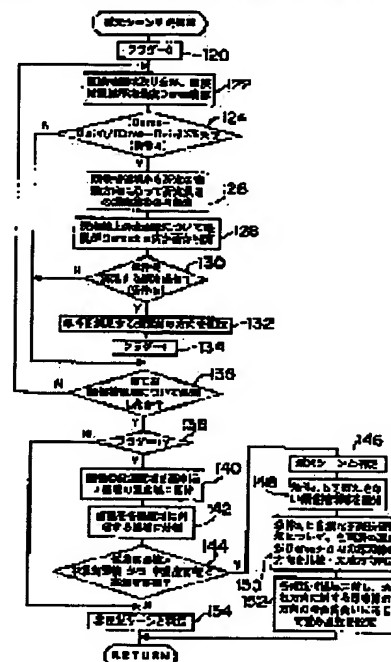
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(54) IMAGE PROCESSING METHOD, IMAGE PROCESSOR AND RECORDING MEDIUM

(57)Abstract:

PROBLEM TO BE SOLVED: To decide an area corresponding to the face of a person with high accuracy even when the density of the area corresponding to the face of a person in an image is biased toward a high density side or a low density side.

SOLUTION: Search lines that radially extend from a face candidate area on an image are set to an area where density is biased toward a high density side (positive in 124) among face candidate areas estimated as corresponding to a human face and whether or not a search line consisting only of pixels whose difference from density Darea in the face candidate area is within $\pm \Delta$ exist is decided (126 to 130). When a face candidate area meeting the condition exists, an image is divided into the area of each density area being high density/low density/intermediate density and whether or not the area of the intermediate density area is smaller than the areas of the other areas is decided (140 to 144). When the decision is positive, the image of a processing object is decided as the image of a backlight scene and accuracy as a face area of a backlight scene is evaluated to each face candidate area (146 to 152).



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CLAIMS

[Claim(s)]

[Claim 1] Based on image data, considerable, then the face candidate field presumed are extracted to the face of the person in the picture which this image data expresses. The absolute value of the concentration in the extracted face candidate field or the relative value of the concentration in the aforementioned face candidate field to the concentration of the aforementioned whole picture Rather than more than the 1st threshold or the 1st threshold of the above, beyond a predetermined value in below the threshold of a low 2nd The range presumed that the field equivalent to the fuselage of the person in the aforementioned picture exists is set up on the basis of the aforementioned face candidate field. A concentration difference with the aforementioned face candidate field within the set-up limits is based on the existence of the field below a predetermined value. [whether the accuracy as a field equivalent to the face of the person of the aforementioned face candidate field is evaluated, and] Or equivalent to a person's fuselage within limits set up on the basis of the aforementioned face candidate field, then the fuselage candidate field presumed are extracted. The image-processing method of evaluating the accuracy as a field equivalent to the face of the person of the aforementioned face candidate field based on the contrast of the concentration in the aforementioned face candidate field and the fuselage candidate field which carried out [aforementioned] extraction, or saturation.

[Claim 2] When the absolute value of the concentration in the aforementioned face candidate field or the relative value of the concentration in the aforementioned face candidate field to the concentration of the aforementioned whole picture is more than a threshold of the above 1st The surface ratio of the field of each concentration region when dividing all the concentration regions of the aforementioned picture into the concentration region more than a three-stage for the accuracy as a field equivalent to the face of the person of the aforementioned face candidate field, and dividing the aforementioned picture into the field of each concentration region, And the image-processing method according to claim 1 characterized by taking into consideration and evaluating at least one side of the biased degree by the side of the low concentration of the concentration distribution in the field which exists in the circumference of the aforementioned face candidate field on the aforementioned picture.

[Claim 3] When the absolute value of the concentration in the aforementioned face candidate field or the relative value of the concentration in the aforementioned face candidate field to the concentration of the aforementioned whole picture is below a threshold of the above 2nd The image-processing method according to claim 1 characterized by the biased degree by the side of the high concentration of the concentration distribution in the field which exists in the circumference of the aforementioned face candidate field taking into consideration and evaluating the accuracy as a field equivalent to the face of the person of the aforementioned face candidate field on the aforementioned picture.

[Claim 4] The image processing system characterized by providing the following. Equivalent to a face, then an extraction means to extract the face candidate field presumed of the person in the picture which this image data expresses based on image data. The absolute value of the concentration in the extracted face candidate field or the relative value of the concentration in

the aforementioned face candidate field to the concentration of the aforementioned whole picture Rather than more than the 1st threshold or the 1st threshold of the above, beyond a predetermined value in below the threshold of a low 2nd The range presumed that the field equivalent to the fuselage of the person in the aforementioned picture exists is set up on the basis of the aforementioned face candidate field. A concentration difference with the aforementioned face candidate field within the set-up limits is based on the existence of the field below a predetermined value. [whether the accuracy as a field equivalent to the face of the person of the aforementioned face candidate field is evaluated, and] Or equivalent to a person's fuselage within limits set up on the basis of the aforementioned face candidate field, then the fuselage candidate field presumed are extracted. An evaluation means to evaluate the accuracy as a field equivalent to the face of the person of the aforementioned face candidate field based on the contrast of the concentration in the aforementioned face candidate field and the fuselage candidate field which carried out [aforementioned] extraction, or saturation.

[Claim 5] Equivalent to the face of the person in the picture which this image data expresses based on image data, then the 1st step which extracts the face candidate field presumed, The absolute value of the concentration in the extracted face candidate field or the relative value of the concentration in the aforementioned face candidate field to the concentration of the aforementioned whole picture Rather than more than the 1st threshold or the 1st threshold of the above, beyond a predetermined value in below the threshold of a low 2nd The range presumed that the field equivalent to the fuselage of the person in the aforementioned picture exists is set up on the basis of the aforementioned face candidate field. A concentration difference with the aforementioned face candidate field within the set-up limits is based on th existence of the field below a predetermined value. [whether the accuracy as a field equivalent to the face of the person of the aforementioned face candidate field is evaluated, and] Or equivalent to a person's fuselage within limits set up on the basis of the aforementioned face candidate field, then the fuselage candidate field presumed are extracted. The record medium with which the program for making a computer perform processing containing the 2nd step which evaluates the accuracy as a field equivalent to the face of the person of the aforementioned face candidate field based on the contrast of the concentration in the aforementioned face candidate field and the fuselage candidate field which carried out [aforementioned] extraction, or saturation was recorded.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to the image-processing method, an image processing system, and a record medium, and relates to the record medium with which the program for performing especially a person's image processing system which can apply [considerable, then] the image-processing method of extracting the field presumed, and this image-processing method to a face and aforementioned image-processing method in a picture by computer was recorded.

[0002]

[Description of the Prior Art] When admiring a person photograph, in carrying out exposure record (it records by field exposure or scanning exposure) of the subject-copy image which the part which attracts attention most is a person's face, for example, was recorded on the photographic film etc. to record material, such as printing paper Although it is desirable to control exposure so that the color and concentration of a face of a person may become proper, in order to realize this exposure control, it is necessary to detect correctly the tint and concentration of a field equivalent to the face of the person in a subject-copy image. moreover, in the various image processings developed for the purpose of the improvement in quality of image of the picture which this image data expresses, to the image data obtained by reading a picture Although there are some which perform specific image processings (for example, local concentration amendment, bloodshot-eyes correction, etc.) only to the field equivalent to the face of the person in a picture or its part, in order to perform this processing, it is necessary to detect correctly the position and size of a field equivalent to the face of the person in a picture.

[0003] For this reason, equivalent to the face of the person in a picture, then the technique for extracting the field presumed are variously proposed from before. For example, it is based on JP,8-184925,A at image data. a configuration pattern (for example, the profile of a head —) peculiar to each part of the person who exists in a picture It searches for any one of the configuration patterns showing the profile of a face, the internal structure of a face, the profil of a fuselage, etc. While setting up the field (candidate field) where the adjustment as a field equivalent to a person's face is high according to the physical relationship of the predetermined portion the person's [whom the size of the detected configuration pattern, the sense, and the detected configuration pattern express], and a person's face It looks for other different configuration patterns from the detected configuration pattern, the adjustment as a person's face of the candidate field set up previously is evaluated, and considerable, then the extraction method of a face field of extracting the field (face field) presumed are indicated by a person's face.

[0004] However, although the brightness (concentration) of the face field in a picture deflects the concentration of a face field to a high concentration (low brightness) side on the picture which changes greatly with lighting conditions over a person's face in the scene showing a picture, for example, expresses a backlight scene, it deflects the concentration of a face field to a low concentration (high brightness) side on the picture showing the scene which made the stroboscope emit light. By the conventional face field extraction method of extracting a face field

from a picture, when it was the picture as which it has the fault that the extraction precision of a face field falls sharply, for example, the picture of a processing object expresses a backlight scene as the concentration of a face field deflected each to the high concentration or low concentration side, it had occurred frequently that the background region of high brightness is incorrect-extracted as a face field.

[0005] Moreover, binarization of the picture is divided and carried out to many blocks, while judging whether it is a backlight scene based on the rule of thumb "the distribution patterns of shading within a picture differ by the backlight picture and the follow light picture" from the brightness and configuration (distribution) of a dark space block according to which it was classified into dark space, to JP,8-62741,A, existence of a person is judged from a beige chromaticity and brightness, and the gradation compensator which was made to perform gradation amendment is indicated.

[0006] However, to most pictures photoed by the camera or the digital still camera having the unfixed and unknown direction of top and bottom, the above-mentioned technology is premised on the direction of top and bottom of a picture being fixed on the occasion of the judgment of a distribution of a dark space block, and is not taken into consideration at all about the case where a picture with the unfixed and unknown direction of top and bottom is processed. Therefore, since application of the above-mentioned technology is difficult about almost all the pictures photoed by the camera or the digital still camera, there is a fault that the scope of technical is narrow. Moreover, since the saturation of a face field became low, to the picture showing a backlight scene, there were judgment precision of a face field and a problem of falling sharply on the picture showing a backlight scene.

[0007] When the concentration of the field which accomplished this invention in consideration of the above-mentioned fact, and is equivalent to the face of the person in a picture is deflecting to the high concentration or low concentration side, it is the purpose to obtain the image-processing method, image processing system, and record medium which can judge the field equivalent to a person's face with high precision.

[0008]

[Means for Solving the Problem] The image-processing method which starts invention according to claim 1 in order to attain the above-mentioned purpose Based on image data, considerable, then the face candidate field presumed are extracted to the face of the person in the picture which this image data expresses. The absolute value of the concentration in the extracted face candidate field or the relative value of the concentration in the aforementioned face candidate field to the concentration of the aforementioned whole picture Rather than more than the 1st threshold or the 1st threshold of the above, beyond a predetermined value in below the threshold of a low 2nd The range presumed that the field equivalent to the fuselage of the person in the aforementioned picture exists is set up on the basis of the aforementioned face candidate field. A concentration difference with the aforementioned face candidate field within the set-up limits is based on the existence of the field below a predetermined value. [whether the accuracy as a field equivalent to the face of the person of the aforementioned face candidate field is evaluated, and] Or equivalent to a person's fuselage within limits set up on the basis of the aforementioned face candidate field, then the fuselage candidate field presumed are extracted. Based on the contrast of the concentration in the aforementioned face candidate field and the fuselage candidate field which carried out [aforementioned] extraction, or saturation, the accuracy as a field equivalent to the face of the person of the aforementioned face candidate field is evaluated.

[0009] In invention according to claim 1, considerable, then the face candidate field presumed are first extracted to the face of the person in the picture which this image data expresses based on image data. On the occasion of extraction of this candidate field, well-known arbitrary algorithms are applicable from before. Next, the concentration in the extracted face candidate field (you may use any, such as average concentration, concentration which corresponds in the center of all the concentration regions in a face candidate field, and concentration equivalent to the peak of the gray level histogram in a face candidate field, that what is necessary is just a value representing the concentration in a face candidate field (or brightness)) is judged.

[0010] When the absolute value of the concentration in the extracted face candidate field or the relative value of the concentration in the face candidate field to the concentration of the whole picture is more than the 1st threshold here [whether since the concentration in the extracted face candidate field is deflecting to the high concentration side, it is the field in which the extracted face candidate field is equivalent to a person's face in a backlight scene, and] Or fields other than the field equivalent to a person's face may have been incorrect-extracted as a face candidate field (in this specification). The field equivalent to a person's face cannot be overemphasized by deflecting to a low concentration side on the negative picture which "concentration" means the concentration on a positive picture, for example, expresses a backlight scene. The absolute value of the concentration in a face candidate field or the relative value of the concentration in the face candidate field to the concentration of the whole picture beyond a predetermined value rather than the 1st threshold moreover, in below the threshold of a low 2nd Since the concentration in the extracted face candidate field was deflecting to the low concentration side, fields other than the field which is a field in which the extracted face candidate field is equivalent to a person's face in the scene which made the stroboscope emit light, or is equivalent to a person's face may have been incorrect-extracted as a face candidate field.

[0011] On the other hand, the result which examined the picture showing the scene on which the invention-in-this-application person made the picture showing a backlight scene, and the stroboscope emit light, lighting conditions and abbreviation of as opposed to a face in lighting conditions [as opposed to a person's fuselage at these scenes] — on the picture showing these scenes from a bird clapper similarly It found out that there was the common feature that the value as the concentration of the field equivalent to a person's face, concentration contrast, saturation contrast, and abbreviation with same concentration of the field equivalent to the fuselage of the aforementioned person who exists near the field equivalent to a person's face, concentration contrast, and saturation contrast is shown. By the picture showing a backlight scene, namely, the field equivalent to the aforementioned person's fuselage By the picture which expresses the scene which made the stroboscope emit light by concentration contrast and saturation contrast becoming small like the concentration of the field equivalent to a person's face while concentration deflects to a high concentration side While concentration as well as the concentration of the field equivalent to a person's face deflected the field equivalent to a person's fuselage to the low concentration side, concentration contrast and saturation contrast found out the bird clapper greatly.

[0012] Based on the above, by invention of a claim 1, when the concentration in a face candidate field (an absolute value or relative value) is more than the 1st threshold or below the 2nd threshold The range presumed that the field equivalent to the fuselage of the person in a picture exists is set up on the basis of a face candidate field. A concentration difference with the face candidate field within the set-up limits is based on the existence of the field below a predetermined value. Equivalent to a person's fuselage within limits which evaluated the accuracy as a field equivalent to the face of the person of a face candidate field, or were set up on the basis of the face candidate field, then the fuselage candidate field presumed are extracted. Based on the contrast of the concentration in a face candidate field and the extracted fuselage candidate field, or saturation, the accuracy as a field equivalent to the face of the person of a face candidate field is evaluated.

[0013] For example, the concentration in a face candidate field (an absolute value or relative value) is more than the 1st threshold. When the field below a predetermined value has a concentration difference with a face candidate field within limits presumed that the field equivalent to the fuselage of the person in the picture set up on the basis of the face candidate field exists A face candidate field has high possibility of being a field equivalent to a person's face in a backlight scene. The concentration in a face candidate field (an absolute value or relative value) is below the 2nd threshold. When the field below a predetermined value has a concentration difference with a face candidate field within limits presumed that the field equivalent to the fuselage of the person in the picture set up on the basis of the face candidate field exists It can be judged that a face candidate field has high possibility of being a field

equivalent to a person's face in the scene which made the stroboscope emitting light. Moreover, when the field below a predetermined value does not have a concentration difference with a face candidate field, it can be judged that a face candidate field has high possibility that it is not a field equivalent to a person's face.

[0014] In addition, if for example, the direction of top and bottom is known, the range presumed that the field equivalent to the fuselage of the person in a picture exists can be set up so that it may be distributed only in the direction in which the field equivalent to a person's fuselage should exist from a face candidate field, and if the direction of top and bottom is strange, it can be determined that it is continued and distributed over a perimeter centering on a face candidate field. Moreover, it can be determined that the size of the aforementioned range becomes large as the size of a face candidate field becomes large.

[0015] Moreover, the concentration in a face candidate field (an absolute value or relative value) is more than the 1st threshold, for example. Equivalent to the fuselage of the person who extracted within limits in a face candidate field set up on the basis of the face candidate field, then when the contrast of the concentration in the fuselage candidate field presumed or saturation is below the 1st predetermined value, respectively A face candidate field has high possibility of being a field equivalent to a person's face in a backlight scene. The concentration in a face candidate field (an absolute value or relative value) is below the 2nd threshold. When the contrast of the concentration in a face candidate field and the aforementioned fuselage candidate field or saturation is beyond the 2nd predetermined value, respectively, it can be judged that a face candidate field has high possibility of being a field equivalent to a person's face in the scene which made the stroboscope emitting light. Moreover, when either [at least] a face candidate field or a fuselage candidate field does not satisfy the above-mentioned conditions, it can be judged that a face candidate field has high possibility that it is not a field equivalent to a person's face.

[0016] In addition, the algorithms equivalent to the fuselage of the person in a picture then with common knowledge more arbitrary than before also about the field presumed, for example, an algorithm given in JP,8-184925,A etc., are applicable.

[0017] And evaluation of the accuracy as a field equivalent to the face of the person of a face candidate field can be performed so that the aforementioned evaluation may become high as possibility of being a field equivalent to a person's face becomes high based on the judgment mentioned above. Thus, since invention of a claim 1 estimates the accuracy as a field equivalent to the face of the person of a face candidate field based on the characteristic quantity (concentration, concentration contrast, or saturation contrast) of a face candidate field and a fuselage candidate field When the concentration of the field equivalent to the face of the person in a picture is deflecting to the high concentration or low concentration side, the accuracy as a field equivalent to a person's face can be evaluated with a sufficient precision, and the field which is equivalent to a person's face based on an evaluation result can be judged with high precision (or extraction).

[0018] In invention of a claim 1, when the absolute value of the concentration in the aforementioned face candidate field or the relative value of the concentration in the aforementioned face candidate field to the concentration of the aforementioned whole picture is more than a threshold of the above 1st, invention according to claim 2 The surface ratio of the field of each concentration region when dividing all the concentration regions of the aforementioned picture into the concentration region more than a three-stage for the accuracy as a field equivalent to the face of the person of the aforementioned face candidate field, and dividing the aforementioned picture into the field of each concentration region, And it is characterized by taking into consideration and evaluating at least one side of the biased degree by the side of the low concentration of the concentration distribution in the field which exists in the circumference of the aforementioned face candidate field on the aforementioned picture.

[0019] While the concentration of the field equivalent to the person in a picture deflects to a high concentration side as mentioned above by the picture showing a backlight scene Since the concentration of the field equivalent to the background in a picture is deflected to a low concentration side, supposing it divides all the concentration regions of a picture into the

concentration region more than a three-stage, for example and divides a picture into the field of each concentration region. The field of a high concentration region and the field of a low concentration region occupy the larger area in a picture respectively, and the area of the field of a middle concentration region becomes small. Moreover, if the field equivalent to the face of the person in the picture showing a backlight scene removes the high-concentration field equivalent to a person's fuselage, since the great portion of circumference is surrounded by the low-concentration field equivalent to a background, the concentration distribution in the field which exists in the circumference of the field equivalent to a person's face is deflected to a low concentration side.

[0020] The above-mentioned property of a picture of expressing a backlight scene with invention according to claim 2 is used. When the concentration in a face candidate field (an absolute value or relative value) is more than the 1st threshold, Namely, when a face candidate field may be a field equivalent to a person's face in a backlight scene. Either [at least] the surface ratio of the field of each concentration region when dividing a picture into the field of the concentration region more than a three-stage or the biased degree by the side of the low concentration of the concentration distribution in the field which exists in the circumference of a face candidate field on a picture is taken into consideration. Since the accuracy as a field equivalent to the face of the person of a face candidate field is evaluated, the field equivalent to the face of the person who exists in the picture showing a backlight scene can be judged more to high degree of accuracy (or extraction).

[0021] In addition, while the concentration of the field equivalent to the person in a picture deflects the picture showing a backlight scene to a high concentration side, since the concentration of the field equivalent to the background in a picture is deflected to a low concentration side, the concentration distribution (gray level histogram) of the whole picture serves as a configuration to which a peak (mountain) appears respectively in a high concentration region and a low concentration region, and a valley appears in a middle concentration region. For this reason, it replaces with the judgment based on the above-mentioned surface ratio, and you may make it evaluate based on the configuration of a gray level histogram.

[0022] In invention of a claim 1, when the absolute value of the concentration in the aforementioned face candidate field or the relative value of the concentration in the aforementioned face candidate field to the concentration of the aforementioned whole picture is below a threshold of the above 2nd, invention according to claim 3. It is characterized by the biased degree by the side of the high concentration of the concentration distribution in the field which exists in the circumference of the aforementioned face candidate field taking into consideration and evaluating the accuracy as a field equivalent to the face of the person of the aforementioned face candidate field on the aforementioned picture.

[0023] On the scene which made the stroboscope emit light, the concentration of the field which the concentration of the field equivalent to the person in a picture deflects to a low concentration side, and is equivalent to the background in a picture is deflected in many cases to a high concentration side. For this reason, if the field equivalent to the face of the person in the picture showing the scene which made the stroboscope emit light removes the low-concentration field equivalent to a person's fuselage, it will be surrounded in many cases by the high-concentration field in which the great portion of circumference is equivalent to a background, and the concentration distribution in the field which exists in the circumference of the field equivalent to a person's face will be deflected in many cases to a high concentration side.

[0024] The above-mentioned property of a picture of expressing with invention according to claim 3 the scene which made the stroboscope emitting light is used. When the concentration in a face candidate field (an absolute value or relative value) is below the 2nd threshold, Namely, when a face candidate field may be a field equivalent to a person's face in the scene which made the stroboscope emit light, the biased degree by the side of the high concentration of the concentration distribution in the field which exists in the circumference of a face candidate field on a picture is also taken into consideration. Since the accuracy as a field equivalent to the face

of the person of a face candidate field is evaluated, the field equivalent to the face of the person who exists in the picture showing the scene which made the stroboscope emit light can be judged more to high degree of accuracy (or extraction).

[0025] That the image processing system concerning invention according to claim 4 is equivalent to the face of the person in the picture which this image data expresses based on image data, then an extraction means to extract the face candidate field presumed, The absolute value of the concentration in the extracted face candidate field or the relative value of the concentration in the aforementioned face candidate field to the concentration of the aforementioned whole picture Rather than more than the 1st threshold or the 1st threshold of the above, beyond a predetermined value in below the threshold of a low 2nd The range presumed that the field equivalent to the fuselage of the person in the aforementioned picture exists is set up on the basis of the aforementioned face candidate field. A concentration difference with the aforementioned face candidate field within the set-up limits is based on the existence of the field below a predetermined value. [whether the accuracy as a field equivalent to the face of the person of the aforementioned face candidate field is evaluated, and] Or equivalent to a person's fuselage within limits set up on the basis of the aforementioned face candidate field, then the fuselage candidate field presumed are extracted. Since it is constituted including an evaluation means to evaluate the accuracy as a field equivalent to the face of the person of the aforementioned face candidate field, based on the contrast of the concentration in the aforementioned face candidate field and the fuselage candidate field which carried out [aforementioned] extraction, or saturation When the concentration of the field equivalent to the face of the person in a picture is deflecting to the high concentration or low concentration side like invention of a claim 1, the field equivalent to a person's face can be judged with high precision (or extraction).

[0026] That the record medium concerning invention according to claim 5 is equivalent to the face of the person in the picture which this image data expresses based on image data, then the 1st step which extracts the face candidate field presumed, The absolute value of the concentration in the extracted face candidate field or the relative value of the concentration in the aforementioned face candidate field to the concentration of the aforementioned whole picture Rather than more than the 1st threshold or the 1st threshold of the above, beyond a predetermined value in below the threshold of a low 2nd The range presumed that the field equivalent to the fuselage of the person in the aforementioned picture exists is set up on the basis of the aforementioned face candidate field. A concentration difference with the aforementioned face candidate field within the set-up limits is based on the existence of the field below a predetermined value. [whether the accuracy as a field equivalent to the face of the person of the aforementioned face candidate field is evaluated, and] Or equivalent to a person's fuselage within limits set up on the basis of the aforementioned face candidate field, then the fuselage candidate field presumed are extracted. The program for making a computer perform processing containing the 2nd step which evaluates the accuracy as a field equivalent to the face of the person of the aforementioned face candidate field based on the contrast of the concentration in the aforementioned face candidate field and the fuselage candidate field which carried out [aforementioned] extraction, or saturation is recorded.

[0027] The processing which contains the 1st above-mentioned step and the 2nd step in the record medium concerning invention according to claim 5, Namely, since the program for making invention of a claim 1 perform processing concerning the image-processing method of a publication to a computer is recorded By reading and executing the program to which the computer is recorded on the aforementioned record medium When the concentration of the field equivalent to the face of the person in a picture is deflecting to the high concentration or low concentration side like invention of a claim 1, the field equivalent to a person's face can be judged with high precision (or extraction).

[0028]

[Embodiments of the Invention] Hereafter, with reference to a drawing, an example of the operation gestalt of this invention is explained in detail.

[0029] The [1st operation gestalt] The image processing system 10 with which this invention was

applied is shown in drawing 1. A scanner 12, an image processing system 14, and a printer 16 are connected in series, and the image processing system 10 is constituted.

[0030] A scanner 12 is a film picture (after photoing a photographic subject) currently recorded on photosensitive material (a photographic film is only called below), such as a photographic film (for example, a negative film and a reversal film). The negative picture or positive picture visualized by a development being carried out is read. The light with which the image data obtained by this reading is outputted, it was injected from the light source 20, and quantity of light unevenness was reduced by the optical diffusion box 22. The photographic films 26 set to the tape carrier package 24, such as a negative film and a reversal film, irradiate. It is constituted so that image formation of the light which penetrated the photographic film 26 may be carried out through a lens 28 on the light-receiving side of the CCD sensor 30 (you may be a line sensor even if it is an area sensor).

[0031] A tape carrier package 24 conveys a photographic film 26 so that the part where the film picture on a photographic film 26 is recorded may be located in order on the optical axis of the injection light from the light source 20. The film picture currently recorded on the photographic film 26 is read in order by the CCD sensor 30 by this, and the signal corresponding to a film picture is outputted from the CCD sensor 30. The signal outputted from the CCD sensor 30 is changed into digital image data by A/D converter 32, and is inputted into an image processing system 14.

[0032] The line scanner amendment section 36 of an image processing system 14. The dark amendment which reduces the dark output level of the cell which corresponds for every pixel from the inputted scanning data (data of R, G, and B inputted from a scanner 12). The concentration conversion which carries out logarithmic transformation of the data which performed dark amendment to the data showing a concentration value. The quantity of light unevenness of the light which illuminates a photographic film 26 is embraced. the data after concentration conversion. An amendment shading compensation, Each processing of the defective pixel amendment which interpolates the data of a cell (the so-called defective pixel) with which the signal corresponding to the amount of incident lights is not outputted among the data which performed this shading compensation from the data of a surrounding pixel, and newly generates them is performed in order. The outgoing end of the line scanner amendment section 36 is connected to the input edge of I/O controller 38, and the data with which each aforementioned processing was performed in the line scanner amendment section 36 are inputted into I/O controller 38 as scanning data.

[0033] The input edge of I/O controller 38 is connected also to the data output edge of an image processor 40, and the image data to which the image processing (it mentions later for details) was performed is inputted from an image processor 40. Moreover, the input edge of I/O controller 38 is connected also to the personal computer 42. The personal computer 42 is equipped with the expansion slot (illustration ellipsis), and the driver (illustration ellipsis) which performs read-out/writing of data to the digital camera card in which image data was written by the digital still camera etc. is connected to this expansion slot. When file image data (image data read from the digital camera card) is inputted from the exterior through an expansion slot, the inputted file image data is inputted into I/O controller 38.

[0034] It connects with the data input edge of an image processor 40, the auto setup engine 44, and the personal computer 42 respectively, and the outgoing end of I/O controller 38 is further connected to the printer 16 through the I/F circuit 54. I/O controller 38 outputs the inputted image data to each aforementioned device connected to the outgoing end alternatively.

[0035] This operation gestalt performs two reading in different resolution in a scanner 12 to each film picture currently recorded on the photographic film 26. Reading of the whole surface of a photographic film 26 is comparatively performed on the 1st reading conditions (quantity of light for every wavelength region of R, G, and B of the light which irradiates a photographic film 26, charge-storage time of the CCD sensor 30) which the concentration of a film picture determined very much that the saturation of a stored charge will not arise by the CCD sensor 30 in a low case (for example, negative picture of the exposure undershirt in a negative film) in reading (henceforth a press can) by the low resolution. The data (press can data) obtained by this press

can are inputted into the auto setup engine 44 from I/O controller 38.

[0036] The auto setup engine 44 is equipped with CPU46, RAM48 (for example, DRAM), ROM50 (for example, ROM which can rewrite the content of storage), and input/output port 52, and these are mutually connected through a bus and it is constituted. The auto setup engine 44 judges the coma position of a film picture based on the press can data inputted from I/O controller 38, and extracts the data (press can image data) corresponding to the film image recording field on a photographic film 26. Moreover, based on press can image data, while judging the size of a film picture, picture characteristic quantity, such as concentration, is calculated, and the reading conditions at the time of a scanner 12 performing reading (henceforth a fine scan) for the second time by high resolution comparatively are determined to the photographic film 26 which performed the press can. And a coma position and reading conditions are outputted to a scanner 12.

[0037] Moreover, the auto setup engine 44 is based on press can image data (or low-resolution-ized file image data). Picture characteristic quantity including extraction of the principal part in a picture (for example, field equivalent to a person's face (face field)) is calculated. A scanner 12 determines automatically the processing conditions of various kinds of image processings over the fine scan image data (or file image data) obtained by performing a fine scan according to an operation (setup operation), and outputs the determined processing conditions to an image processor 40.

[0038] The display, the keyboard, and the mouse are connected to the personal computer 42 (all ar illustration ellipses). A personal computer 42 incorporates the processing conditions of the image processing for which it opted with the auto setup engine 44, performs an image processing equivalent to the image processing performed by the image processor 40 for a high-resolution image data to low resolution picture data based on the incorporated processing conditions, and generates simulation image data while it incorporates the image data of a low resolution from th auto setup engine 44.

[0039] And the generated simulation image data is changed into the signal for displaying a picture on a display, and a simulation picture is displayed on a display based on this signal. Moreover, if the information which official approval of quality of image etc. is performed by the operator, and directs correction of processing conditions as an official approval result to the displayed simulation picture is inputted through a keyboard, this information will be outputted to the auto setup engine 44. Thereby, with the auto setup engine 44, processing of the re-operation of the processing conditions of an image processing etc. is performed.

[0040] The fine scan image data (or file image data) inputted into I/O controller 38 by performing a fine scan to a film picture with a scanner 12 on the other hand is inputted into an image processor 40 from I/O controller 38. An image processor 40 is respectively equipped with the image-processing circuit which performs various kinds of image processings, such as hyper-sharpness processing in which sharpness is emphasized, suppressing the shape of a color and concentration amendment processing including a gray scale conversion or color conversion, pixel density transform processing, the hyper-tone processing that compresses the gradation of the extremely-low-frequency brightness component of a picture, and a grain, and performs various image processings to the inputted image data according to the processing conditions determined and notified for every picture with the auto setup engine 44.

[0041] As an image processing which can be performed by the image processor 40 In addition to the above, for example, the whole picture, the sharpness amendment which receives in part (for example, field equivalent to a person's face), or soft focus processing, the image processing (the image processing which makes a monotone to an output picture --) which changes a drawing tone intentionally The image processing which makes a portrait tone to an output picture, the image processing which makes a sepia tone to an output picture, the image processing (for example, the image processing for making a thin figure to the person who exists in a subject-copy image on the main picture --) which processes a picture As opposed to the image processing which corrects bloodshot eyes, and the picture photoed by LF (disposable camera) The geometric distortion of the picture resulting from the distortion aberration of the lens of LF, and the chromatic aberration of magnification, The lightness fall of the periphery section of the

picture which originates a color gap in limb darkening of amendment LF aberration amendment processing and the lens of LF Amendment limb-darkening amendment processing, LF aberration amendment processing of amendment various kinds etc. is mentioned in deterioration of the quality of image of the output picture which originates the fall of the sharpness of the picture resulting from the property of the lens of LF in the property of the lens of LF like amendment focus dotage amendment processing.

[0042] When using for record of the picture to printing paper the image data to which the image processing was performed by the image processor 40, the image data to which the image processing was performed is outputted to a printer 16 as image data for record through the I/F circuit 54 from I/O controller 38 by the image processor 40. Moreover, when outputting to the exterior by making the image data after an image processing into an image file, image data is outputted to a personal computer 42 from I/O controller 38. This outputs the image data inputted from I/O controller 38 as an object for the output to the exterior as an image file through an expansion slot in a personal computer 42 to the exteriors (for example, the write-in equipment which writes image data in information-storage media, such as CD-R, other information processors connected through the communication controller).

[0043] The printer 16 is equipped with the laser driver 62 which controls the operation of an image memory 58, the laser light source 60 of R, G, and B, and this laser light source 60. Once the image data for record inputted from the image processing system 14 is memorized by the image memory 58, it is read, and it is used for the modulation of the laser beam of R, G, and B which are injected from a laser light source 60. The laser beam injected from the laser light source 60 has a printing paper 68 top scanned through the polygon mirror 64 and the ftheta lens 66, and exposure record of the picture is carried out at printing paper 68. The printing paper 68 in which exposure record of the picture was carried out is sent to the processor section 18, and each processing of the color development, bleaching fixing, rinsing, and dryness is performed. Thereby, the picture by which exposure record was carried out is visualized by printing paper 68.

[0044] Next, the face field extraction and concentration data processing performed after inputting press can data into an image processing system 14 and processing logging of the image data from press can data etc. in the auto setup engine 44 as an operation of this operation gestalt from a scanner 12 are explained.

[0045] It is the processing to which the image-processing method concerning invention of a claim 1 was applied, and face field extraction and concentration data processing concerning this operation gestalt (the backlight scene judging processing and stroboscope luminescence scene judging processing which are mentioned later are included) are realized by performing face field extraction and a concentration amendment program by CPU46 of the auto setup engine 44. The information-storage medium 72 (refer to drawing 1) memorizes at the beginning with the program for face field extraction and a concentration amendment program performing other processings by CPU46. In addition, although the information-storage medium 72 is shown as a floppy disk, other information-storage media, such as CD-ROM and memory card, may constitute from drawing 1. If the information read-out equipment (illustration ellipsis) connected to the personal computer 42 is loaded with the information-storage medium 72 and import (installation) of the program from the information-storage medium 72 to an image processing system 14 is directed, with information read-out equipment, face field extraction, a concentration amendment program, etc. will be read from the information-storage medium 72, and ROM50 which can rewrite the content of storage will memorize.

[0046] And if the timing which should perform face field extraction and concentration amendment processing comes, face field extraction and a concentration amendment program will be read from ROM50, and face field extraction and a concentration amendment program will be performed by CPU46. Thereby, the auto setup engine 44 functions as an image processing system concerning invention of a claim 4. Thus, the information-storage medium 72 which has memorized face field extraction, the concentration amendment program, etc. is equivalent to the record medium according to claim 5.

[0047] Hereafter, face field extraction and concentration amendment processing are explained with reference to the flow chart of drawing 2. Considerable, then face candidate field extraction

processing in which the field (face candidate field) presumed is extracted are performed to the face of the person in a picture from the picture which image data expresses with Step 100 based on the image data of a processing object. As a sampling procedure for performing this face candidate field extraction processing Equivalent to the face of the person in a picture, then the face candidate field sampling procedure which judges the field presumed and extracts this field as a face candidate field, Considerable, then the background removal method which judges the field (background region) presumed and extracts fields other than a background region as a face candidate field are in the background in a picture. specifically Inside [it is the following face candidate sampling procedures better known than before and a background removal method] can adopt at least any they are, and face candidate field extraction processing can be performed.

[0048] [Example 1 of a face candidate field sampling procedure] While dividing a picture into much point of measurement, each point of measurement R, It is based on the data (image data) obtained by decomposing into three colors of G and B. it judges whether each point of measurement is contained within the limits of flesh color on the color coordinate, and the field where the cluster (group) of the point of measurement judged to be within the limits of flesh color exists is extracted as a face candidate field (a Provisional-Publication-No. 52 No. -156624 official report --) Provisional Publication No. 52 No. -156625 official report, JP,53-12330,A, Provisional Publication No. 53 No. -145620 official report, Provisional Publication No. 53 No. -145621 official report, Provisional Publication No. References, such as 53 No. -145622 official report.

[0049] [Example 2 of a face candidate field sampling procedure] It asks for the histogram about a hue value (and saturation value) based on the aforementioned image data. It divides into the group corresponding to the mountain which judged to any of the mountain which divided the histogram for which it asked for every mountain, and each point of measurement divided it would belong, and divided each point of measurement. A picture is divided into two or more fields for every group, the field which is equivalent to a person's face among two or more of these fields is presumed, and the presumed field is extracted as a face candidate field (refer to JP,4-346333,A).

[0050] [Example 3 of a face candidate field sampling procedure] It searches for any one of the configuration patterns (for example, configuration pattern showing the profile of a head, the profile of a face, etc.) peculiar to each part of the person who exists in a picture based on the aforementioned image data. According to the physical relationship of the predetermined portion the person's [whom the size of the detected configuration pattern, the sense, and the detected configuration pattern express], and a person's face, considerable, then the field presumed are set as a person's face. Moreover, it looks for other different configuration patterns from the detected configuration pattern, the adjustment as a person's face of the field set up previously is searched for, and a face candidate field is extracted (references, such as JP,8-122944,A, JP,8-184925,A, and JP,9-138471,A).

[0051] [Example 4 of a face candidate field sampling procedure] While calculating the variation of the concentration in each part in a picture, or brightness for every direction based on the aforementioned image data and setting up a reference point The search direction pattern showing the change direction of the concentration or the brightness in each part of this search range and search within the limits for which it should search is set up to this reference point according to the profile configuration of a face field. The variation of the concentration which met in the direction which exists in aforementioned search within the limits, and the aforementioned search direction pattern expresses, or brightness searches the part beyond a predetermined value. By repeating setting up this part as a next reference point, when the part with which are satisfied of search conditions is detected, and extracting the line which connects two or more places of the picture set up in order as the aforementioned reference point, and changes as a border line showing the profile of a face field A face candidate field is extracted (references, such as JP,9-138471,A).

[0052] [Example 1 of a background removal method] It is based on the aforementioned image data. each point of measurement It judges whether it is contained within the limits of the specific

colors (for example, blue of empty or the sea, grass, wooden green, etc.) which belong to a background clearly on a color coordinate. The field where the cluster (group) of the point of measurement judged to be specific aforementioned color within the limits exists is judged to be a background region, it removes, and the field which remained is extracted as a non-background region (field where possibility that the field equivalent to a person's face is included is high : also this face candidate field of this invention).

[0053] [Example 2 of a background removal method] after dividing a picture as well as Example 2 of a previous principal part sampling procedure into two or more fields based on the aforementioned image data the characteristic quantity (the ratio for the bay contained in a profile —) as a field which is equivalent to a background for every field The degree of axial symmetry, the number of irregularity, ratio contact with a picture rim, the concentration contrast in a field, Ask for the existence of the change pattern of the concentration in a field etc., and the field which each field judged whether it was a background region based on the calculated characteristic quantity, and was judged to be a background is removed. The field which remained is extracted as a non-background region (face candidate field) (references, such as JP,8-122944,A and JP,8-184925,A).

[0054] In addition, the above-mentioned sampling procedure is a mere example, and from a picture, if it is the sampling procedure which extracts the field presumed, it cannot be overemphasized equivalent to a person's face, then that it can apply no matter it may be what method. Moreover, at Step 100, respectively with the application of two or more sorts of sampling procedures, face candidate field extraction processing may be performed two or more times, processing conditions may be respectively changed by the sampling procedure of a single kind, and face candidate field extraction processing may be performed two or more times. In addition, Step 100 corresponds to the extraction means according to claim 4.

[0055] Backlight scene judging processing is performed at the following step 102. Hereafter, this backlight scene judging processing is explained with reference to the flow chart of drawing 3 . At Step 120, initial setting of the flag is carried out to 0. At Step 122, the data of a single face candidate field are incorporated out of the face candidate field extracted by face candidate field extraction processing of previous Step 100, and the average concentration Darea in a face candidate field is calculated. Henceforth [the following step 124], it judges whether it is the field ("the face field of a backlight scene" is only called hereafter) in which the face candidate field which incorporated data is equivalent to the face of the person in the picture showing a backlight scene.

[0056] That is, at Step 124, it is the maximum concentration Dmax of the picture of a processing object. And the minimum concentration Dmin After asking, it judges whether the conditions (it is called Conditions a for convenience) as which the average concentration Darea in a face candidate field is specified by the following formula are fulfilled.

(Darea-Dmin) The left part of the conditional expression of the $(D_{max}-D_{min}) > 75\%$ above expresses the relative value of the concentration in the face candidate field to the concentration of the whole picture of a processing object (average concentration), and the numeric value of the right-hand side corresponds to the 1st threshold concerning this invention. In addition, you may be made to perform the above-mentioned judgment by replacing with the relative value of the concentration in a face candidate field, and comparing the absolute value of this concentration with a predetermined value (the 1st threshold) using the absolute value of the concentration in a face candidate field.

[0057] It can be judged that the face candidate field which incorporated data at Step 122 is not a face field of a backlight scene since the concentration in a face candidate field is not deflecting to a high concentration side (low brightness side) when the judgment of Step 124 is denied. Therefore, when the judgment of Step 124 is denied, the judgment of being the face field of a backlight scene is stopped, and it shifts to Step 136.

[0058] On the other hand, when the judgment of Step 124 is affirmed, it shifts to Step 126, and the search line (refer to the arrow shown in drawing 5 as an example) of the predetermined length prolonged in a radial in two or more predetermined directions centering on a face candidate field is set up respectively. In addition, since this search line is for searching the field

(fuselage field of a backlight scene) in which a face candidate field assumes in that it is the face field of a backlight scene, and is equivalent to a person's fuselage, the length of a search line can be made into the double-precision grade of the longitudinal direction length of for example, a face candidate field.

[0059] Moreover, if the direction of top and bottom of the picture of a processing object is known, since the direction where the fuselage field may exist to a face field will be limited, only by meeting in the direction in which the fuselage field may exist based on top-and-bottom information, you may make it set up a search line. Top-and-bottom information in addition, when the image data of a processing object is image data obtained by reading the picture currently recorded on the photographic film in which the magnetic layer was formed, [for example,] Magnetic recording is carried out to the magnetic layer of a photographic film in many cases to the timing at the time of photography record of a picture etc., and, in such a case, top-and-bottom information can be acquired by reading magnetically the information by which magnetic recording is carried out to the magnetic layer.

[0060] At the following step 128, a difference with the average concentration Darea in a face candidate field judges respectively whether it is less than the predetermined value alpha about all the pixels on the search line set up at Step 126. In addition, the predetermined value alpha can use the value about "20", supposing for example, a concentration value is expressed with the value of 0-255 by the data (28 = 256) which are 8 bits. And it judges whether there is any search line which is satisfied [with Step 130] of the conditions "the concentration of all the pixels on a search line is the inside of Darea**alpha."

[0061] In addition, below, the judgment of Step 130 is called conditions b for convenience. The judgment of Step 130 corresponds to the thing according to claim 1 "for which the accuracy as a field in which a concentration difference with the face candidate field within the range (rang which set up the search line) presumed that the field equivalent to the fuselage of the person in a picture exists is equivalent to the face of the person of a face candidate field based on the existence of the field below a predetermined value is evaluated."

[0062] By the picture showing a backlight scene, the concentration of a fuselage field as well as a face field is deflected to a high concentration side. Therefore, since it can judge that neither of the search lines starts the field which concentration is deflecting in the high concentration region, and the field which may be a fuselage field of a backlight scene does not exist in the circumference of a face candidate field when the judgment of Step 130 is denied, the judgment of being the face field of a backlight scene is stopped, and it shifts to Step 136. Moreover, when the judgment of Step 130 is affirmed, it shifts to Step 132, and the concentration of all the pixels on the search line concerning the field which concentration is deflecting in the high concentration region, i.e., a search line, memorizes the direction where a search line is prolonged about the search line in Darea**alpha (for example, search line caudad prolonged in drawing 5). And 1 is substituted for the following step 136 at a flag, and it shifts to Step 136.

[0063] At Step 136, it judges whether the processing and the judgment after Step 122 were performed to all the face candidate fields extracted by face candidate field extraction processing (Step 100). Steps 122-136 are repeated until it returns to Step 122 and the aforementioned judgment is affirmed, when a judgment is denied. By this, it will be respectively judged to all face candidate fields whether it is the face field of a backlight scene. And if the judgment of Step 136 is affirmed, it will shift to Step 138.

[0064] At Step 138, a flag judges whether it is 1. Since the face candidate field which fulfills Conditions a (judgment of Step 124) and Conditions b (judgment of Step 130) does not exist when the judgment of Step 138 is denied, it can be judged that the picture of a processing object is not a picture showing a backlight scene. For this reason, the picture of a processing object is judged at Step 154 to be a picture showing a non-backlight scene, and backlight scene judging processing is ended. Moreover, since the picture of a processing object may be a picture showing a backlight scene when the judgment of Step 138 is affirmed, all the concentration regions of a processing-object picture are classified into the concentration region of a three-stage at Step 140, and the picture of a processing object is classified into the field corresponding to each concentration region at the following step 140.

[0065] The concentration distribution (gray level histogram) of the usual picture (picture showing a non-backlight scene) serves as a configuration to which a peak appears in a middle concentration region by the concentration and the bird clappers with proper concentration of the principal part, such as a face field, as shown in drawing 6 (A) as an example. On the other hand, the picture showing a backlight scene serves as a configuration to which a peak appears respectively in a high concentration region and a low concentration region as shown in drawing 6 (B) as an example, when the concentration of the principal parts, such as a face field, deflects to a high concentration side and the concentration of a background region deflects to a low concentration side (high brightness side). Since the area of each field corresponding to each concentration region on a picture is proportional to the cumulative frequency for every concentration region in a gray level histogram, even if it compares drawing 6 (A) with drawing 6 (B), it has the feature that the picture showing a backlight scene has a very small area of the middle concentration field corresponding to a middle concentration region so that clearly.

[0066] For this reason, at the following step 144, the area of the low concentration field corresponding to a low concentration region is larger than the area of a middle concentration field, and the area of the high concentration field corresponding to a high concentration region judges whether they are latus (that is, (low concentration field area > middle concentration field area and middle concentration field area < high concentration field area), does it fill or not?) rather than the area of a middle concentration field. The number of concentration regions classified at previous Step 140 may classify all the concentration regions of a processing-object picture into the concentration region of four or more a large number that what is necessary is just the number which can judge Step 144. The judgment of Step 144 corresponds to the thing according to claim 2 "for which the surface ratio of the field of each concentration region when dividing all the concentration regions of a picture into the concentration region more than a three-stage for the accuracy as a field equivalent to the face of the person of a face candidate field, and dividing a picture into the field of each concentration region is also taken into consideration and evaluated."

[0067] It is different from the concentration distribution with the concentration distribution of the whole picture of a processing object peculiar to the picture showing a backlight scene when the judgment of Step 144 is denied, and since possibility that the picture of a processing object is not a picture showing a backlight scene is high, the picture of a processing object is judged at Step 154 to be a picture showing a non-backlight scene, and backlight scene judging processing is ended.

[0068] On the other hand, since the concentration distribution peculiar to the picture as which the face candidate field which fulfills Conditions a and Conditions b exists, and the concentration distribution of the whole picture of a processing object also expresses a backlight scene is shown when the judgment of Step 144 is affirmed, the picture of a processing object is judged at Step 146 to be a picture showing a backlight scene. At the following step 148, if the face candidate field which does not fulfill Conditions a and Conditions b is in the face candidate field extracted by face candidate field extraction processing, this field will be excepted from a face candidate field. The direction where the search line (search line whose concentration of all the pixels on a search line was in $Darea \times \alpha$) which was satisfied [with Step 150] of the conditions b in the face candidate field (face candidate field which was not excepted at Step 148) which fulfills Conditions a and Conditions b is prolonged is compared, and the direction of top and bottom of a picture is judged.

[0069] This judgment can calculate the number of the face candidate fields whose directions where the search line with which were satisfied of for example, the conditions b is prolonged correspond for every direction, and can be performed because the number of face candidate fields judges the most directions to be the direction of top and bottom. Moreover, at Step 150, if there is a face candidate field where the direction where the search line which satisfied Conditions b into each face candidate field is prolonged differs from the direction of top and bottom which carried out [aforementioned] the judgment greatly, this field will be excepted from a face candidate field.

[0070] And according to the adjustment degree (coincidence degree) of the direction where the

search line which was satisfied [with the following step 152] of the conditions b over the direction of top and bottom judged at Step 150 to each face candidate field is prolonged, weight mark are set up respectively. In addition, these weight mark correspond to the evaluation value which evaluates the accuracy as a field equivalent to the face of the person of a face candidate field, and Step 152 corresponds to the evaluation means according to claim 4 with the judgment of Steps 124, 130, and 144.

[0071] By the above-mentioned backlight scene judging processing, the picture of a processing object is a picture of a backlight scene, and weight mark high only about the face candidate field which is equivalent to the face field of a backlight scene though the field which is not a face field in fact is intermingled in a face candidate field can be set up. If Step 152 is processed, backlight scene judging processing will be ended and it will shift to Step 104 of the flow chart of drawing 2.

[0072] It judges whether it was judged with the picture as which the picture of a processing object expresses a backlight scene in Step 104 in the backlight scene judging processing mentioned above. Although it shifts to Step 112 when a judgment is affirmed, when a judgment is denied, it shifts to Step 106, and stroboscope luminescence scene judging processing is performed. Hereafter, this stroboscope luminescence scene judging processing is explained with reference to the flow chart of drawing 4.

[0073] At Step 170, initial setting of the flag is carried out to 0. At Step 172, the data of a single face candidate field are incorporated out of the face candidate field extracted by face candidate field extraction processing, and the average concentration D_{area} in a face candidate field is calculated. Henceforth [the following step 174], it judges whether it is the field ("the face field of a stroboscope luminescence scene" is only called hereafter) in which the face candidate field which incorporated data is equivalent to the face of the person in the picture showing the scene which made the stroboscope emit light.

[0074] That is, at Step 174, it is the maximum concentration D_{max} of the picture of a processing object. And the minimum concentration D_{min} . After asking, it judges whether the conditions (it is called Conditions c for convenience) as which the average concentration D_{area} in a face candidate field is specified by the following formula are fulfilled.

$(D_{area} - D_{min}) / (D_{max} - D_{min}) < 25\%$ above expresses the relative value of the concentration in the face candidate field to the concentration of the whole picture of a processing object (average concentration), and the numeric value of the right-hand side corresponds to the 2nd threshold concerning this invention. In addition, you may be made to perform the above-mentioned judgment by replacing with the relative value of the concentration in a face candidate field, and comparing the absolute value of this concentration with a predetermined value (the 2nd threshold) using the absolute value of the concentration in a face candidate field.

[0075] It can be judged that the face candidate field which incorporated data at Step 172 is not a face field of a stroboscope luminescence scene since the concentration in a face candidate field is not deflecting to a low concentration side when the judgment of Step 174 is denied. Therefore, when the judgment of Step 174 is denied, the judgment of being the face field of a stroboscope luminescence scene is stopped, and it shifts to Step 188.

[0076] On the other hand, when the judgment of Step 174 is affirmed, it shifts to Step 176, and the search range for searching the fuselage candidate field equivalent to a person's fuselage to the picture of a processing object is set up. In addition, as a search range of a fuselage candidate field, a face candidate field and the field whose center position corresponds (the shape of a circle configuration or a rectangle has) can be set up, for example (the field of a circle configuration is shown in drawing 7 (A)), and it can be determined that the size of the search range becomes large as the size of a face candidate field becomes large. Moreover, if the direction of top and bottom of the picture of a processing object is known, since the direction where the fuselage field may exist to a face field will be limited, the search range can be set up so that the search range may be distributed only in the direction in which it may see from a face candidate field based on top-and-bottom information, and the fuselage candidate field may exist (refer to drawing 7 (B) as an example).

[0077] If the search range is set up as mentioned above, it will be set-up search within the limits, and Step 174 will be searched for a fuselage candidate field. Search of a fuselage candidate field can look for the configuration pattern which is search within the limits and expresses the profile of a person's fuselage, and can be performed by judging the adjustment as a field equivalent to a person's fuselage based on physical relationship with the detected size of a configuration pattern, the sense, and the detected configuration pattern and face candidate field as indicated by JP,8-184925,A. Moreover, on the occasion of search of the configuration pattern showing the profile of a fuselage, you may apply well-known technology, such as the extraction method of the specific configuration field a publication, to JP,9-138471,A.

[0078] At the following step 178, it judges whether there was any field which can be judged to be a fuselage candidate field by search of the above-mentioned fuselage candidate field. When a judgment is denied, since it can judge that the face candidate field which incorporated data at Step 172 is not a face field of a stroboscope luminescence scene, a face candidate field stops the judgment of being the face field of a stroboscope luminescence scene, and shifts to Step 188. Moreover, when the judgment of Step 178 is affirmed, it shifts to Step 180, and the average concentration in the fuselage candidate field extracted by search of a fuselage candidate field is calculated, and a difference with the average concentration Darea in a face candidate field judges whether it is less than the predetermined value alpha.

[0079] In addition, below, the judgment of Step 180 is called conditions d for convenience. The judgment of Step 180 also corresponds to the thing according to claim 1 "for which the accuracy as a field in which a concentration difference with the face candidate field within the range (the search range of a fuselage candidate field) presumed that the field equivalent to the fuselage of the person in a picture exists is equivalent to the face of the person of a face candidate field based on the existence of the field below a predetermined value (fuselage candidate field which fulfills Conditions d) is evaluated."

[0080] By the picture showing a stroboscope luminescence scene, the concentration of a fuselage field as well as a face field is deflected to a low concentration side. For this reason, since it can judge that the extracted fuselage candidate field has high possibility that it is not a field equivalent to a person's fuselage if the picture of a processing object is assumed to be the picture of a stroboscope luminescence scene when the judgment of Step 180 is denied, the judgment of being the face field of a stroboscope luminescence scene is stopped, and it shifts to Step 188. Moreover, when the judgment of Step 180 is affirmed, it shifts to Step 182, and considerable, then the concentration distribution in the circumference field which set up the field (circumference field) presumed (refer to drawing 7 (C) as an example), and was set up are calculated for the background in the picture which exists in the circumference of a face candidate field on the basis of a face candidate field.

[0081] As for the concentration distribution (gray level histogram) of the field which is equivalent to the background in a picture here by the usual picture (picture which expresses with a non-backlight the scene which does not make a stroboscope emit light), as shown in drawing 8 (A) as an example, the position deflected to the high concentration side a little has more the configurations and bird clappers in which a peak appears than the center of the concentration region of the whole picture. On the other hand, as the concentration distribution (gray level histogram) of the background region in the picture showing a stroboscope luminescence scene is shown in drawing 8 (B) as an example, the configuration and bird clapper which the position of a peak deflected to the high concentration side extremely are almost the case. Although a part of low concentration field equivalent to a person's fuselage will be included as the above-mentioned circumference field is shown in drawing 7 (C) when a face candidate field is a face field of a stroboscope luminescence scene, since the area which this field occupies to a circumference field is small, a concentration distribution serves as a configuration as similarly shown in drawing 8 (B).

[0082] For this reason, at the following step 184, the biased degree by the side of the high concentration of the concentration distribution in the circumference field calculated at previous Step 182 judges whether it is more than a threshold. In addition, the biased degree of a concentration distribution can be expressed using a concentration value when the biased degree

of the peak position of the configuration of a concentration distribution and the cumulative frequency from a high concentration side become a predetermined value etc., and the judgment of Step 184 can be performed by comparing with a predetermined value any of such characteristic quantity they are. Moreover, below, the judgment of Step 184 is called conditions e for convenience. The judgment of Step 184 corresponds to the thing according to claim 3 "for which the biased degree by the side of the high concentration of the concentration distribution in the field which exists in the circumference of a face candidate field also takes into consideration and evaluates the accuracy as a field equivalent to the face of the person of a face candidate field on a picture."

[0083] Since it can judge that the face candidate field which incorporated data at Step 172 has high possibility that it is not the face field of a stroboscope luminescence scene when the judgment of Step 184 is denied, the judgment of being the face field of a stroboscope luminescence scene is stopped, and it shifts to Step 188. Moreover, when the judgment of Step 184 is affirmed, it shifts to Step 186, and 1 is substituted for a flag and it shifts to Step 188.

[0084] At Step 188, it judges whether the processing and the judgment after Step 172 were performed to all the face candidate fields extracted by face candidate field extraction processing (Step 100). Steps 172-188 are repeated until it returns to Step 172 and the aforementioned judgment is affirmed, when a judgment is denied. By this, it will be respectively judged to all face candidate fields whether it is the face field of a stroboscope luminescence scene. And if the judgment of Step 188 is affirmed, it will shift to Step 190.

[0085] At Step 190, a flag judges whether it is 1. Since the face candidate field which fulfills Conditions c (judgment of Step 174), Conditions d (judgment of Step 180), and Conditions e (judgment of Step 184) does not exist when the judgment of Step 190 is denied, it can be judged that the picture of a processing object is not a picture showing a stroboscope luminescence scene. For this reason, the picture of a processing object is judged at Step 200 to be a picture showing a non-stroboscope luminescence scene, and stroboscope luminescence scene judging processing is ended.

[0086] On the other hand, since the face candidate field with which are respectively satisfied of Conditions c, Conditions d, and Conditions e exists when the judgment of Step 190 is affirmed, it shifts to Step 192, and the picture of a processing object is judged to be a picture showing a stroboscope luminescence scene. At the following step 194, if the face candidate field which does not fulfill each conditions of Conditions c, Conditions d, and Conditions e is in the face candidate field extracted by face candidate field extraction processing, this field will be excepted from a face candidate field.

[0087] At Step 196, the direction where the fuselage candidate field respectively extracted corresponding to each face candidate field exists is compared to the face candidate field (face candidate field which was not excepted at Step 194) which fulfills each aforementioned conditions, and the direction of top and bottom of a picture is judged. The direction where for example, the fuselage candidate field exists can calculate the number of the same face candidate fields for every direction, and can perform this judgment because the number of face candidate fields judges the most directions to be the direction of top and bottom.

[0088] And at the following step 198, weight mark are respectively set up to each face candidate field according to the adjustment degree (coincidence degree) of the direction where the fuselage candidate field to the direction of top and bottom judged at Step 196 exists, and the biased degree by the side of the high concentration of the concentration distribution in the boundary region of each face candidate field. In addition, these weight mark correspond to the evaluation value which evaluates the accuracy as a field equivalent to the face of the person of a face candidate field, and Step 152 corresponds to the evaluation means according to claim 4 with the judgment of Steps 174, 180, and 184.

[0089] By the above-mentioned stroboscope luminescence scene judging processing, the picture of a processing object is a picture of a stroboscope luminescence scene, and weight mark high only about the face candidate field which is equivalent to the face field of a stroboscope luminescence scene though the field which is not a face field in fact is intermingled in a face candidate field can be set up. If Step 198 is processed, stroboscope luminescence scene judging

processing will be ended and it will shift to Step 108 of the flow chart of drawing 2.

[0090] It judges whether it was judged with the picture as which the picture of a processing object expresses a stroboscope luminescence scene in Step 108 in the stroboscope luminescence scene judging processing mentioned above. When a judgment is affirmed, it shifts to Step 112. Moreover, when a judgment is denied, in Step 110, the accuracy as a field equivalent to the face of the person of a face candidate field is evaluated in accordance with the usual error criterion to each face candidate field (when it judges that the picture of a processing object is not the picture showing a backlight scene but a picture showing a stroboscope luminescence scene, either), and weight mark are respectively set as each face candidate field according to an evaluation result.

[0091] Step 112 compares respectively the weight mark P of each face candidate field with the threshold THF for a face field judging, and the weight mark P are Threshold THF. It is extract d, using the above face candidate field as a face field (selection). Moreover, at the following step 114, according to the following (1) formula or (2) formulas, the face field concentration Mface of the picture of a processing object is calculated, and face field extraction and concentration data processing are ended.

[0092]

[Equation 1]

$$M_{face} = \sum_{i=1}^N (M_i \cdot P_i) / \sum_{i=1}^N P_i \quad \dots (1)$$

$$M_{face} = \sum_{i=1}^N (M_i \cdot P_i \cdot S_i) / \sum_{i=1}^N (P_i \cdot S_i) \quad \dots (2)$$

[0093] However, the sign for i discriminating each face candidate field and N are the total of a face candidate field, and Mi. The concentration of the face candidate field i, and Pi The weight mark of the face candidate field i, and Si It is the area of the face candidate field i.

[0094] (1) The face field concentration Mface is the weighted average efficiency of the concentration M of each face candidate field, by (1) formula, is carrying out weighting of each face candidate field based on the weight mark P of each face candidate field, and is carrying out weighting of each face candidate field based on the weight mark P and area S in (2) formulas so that more clearly than a formula and (2) formulas.

[0095] If the above-mentioned face field extraction and concentration data processing are performed, although the auto setup engine 44 calculates further the processing conditions of various kinds of image processings performed by the image processor 40, the processing result of face field extraction and concentration data processing will be used for the operation of the processing conditions of a part of image processings. For example, the face field extracted at previous Step 112 is used for the operation of the image processings (for example, sharpness amendment, bloodshot-eyes amendment, etc. to a face field) only for the face field performed by the image processor 40, or its part, and processing conditions are set up so that the aforementioned image processing may be performed only for a face field. Moreover, processing conditions, such as concentration amendment conditions, calculate the face field concentration Mface calculated at previous Step 114 so that it may be used for the image processings (for example, a color, concentration amendment, etc.) for the whole picture performed by the image processor 40, for example, the face field concentration Mface may turn into predetermined concentration.

[0096] As explained also in advance, with a **** 1 operation gestalt Since the picture of a processing object judged based on Conditions a and b etc. for whether it is the picture of a backlight scene, and it has judged based on Conditions c, d, and e for whether it is the picture of a stroboscope luminescence scene when it is not the picture of a backlight scene The picture of a processing object is the picture of a backlight scene, or a picture of a stroboscope luminescence scene, and by incorrect extraction of the face candidate field in face candidate field extraction processing Though the field which is not a face field in fact is intermingled in the extracted face candidate field While the probability that high weight mark will not be set as the field incorrect-extracted according to the conditions mentioned above, and the face candidate

field which is not a face field in fact will be extracted as a face field is reduced sharply. It can also be prevented that face field concentration changes with the concentration of the face candidate field which is not a face field in fact sharply.

[0097] Therefore, proper processing conditions are acquired also to each image processing which processing conditions calculate using the extraction result of a face field, or the face field concentration M_{face} , and a processing result proper also about each image processing performed by the image processor 40 for fine scan image data is obtained.

[0098] The [2nd operation gestalt] The 2nd operation gestalt of this invention is explained below. In addition, since a **** 2 operation gestalt is the same composition as the 1st operation gestalt, the same sign is given to each portion, explanation of composition is omitted, and only a portion which is different from the 1st operation gestalt about an operation of the 2nd operation gestalt is explained hereafter.

[0099] With a **** 2 operation gestalt, it replaces with backlight scene judging processing (drawing 3) in which it explained with the 1st operation gestalt, and backlight scene judging processing shown in drawing 9 is performed. When the judgment of Step 124 is affirmed, it shifts to Step 156 (when the face candidate field fulfills Conditions a), and like Step 176 of the stroboscope luminescence scene judging processing (drawing 4) concerning the 1st operation gestalt, the fuselage candidate area search range is set up and this backlight scene judging processing is searched for a fuselage candidate field. At the following step 158, it judges whether there was any field which can be judged to be a fuselage candidate field by search of a fuselage candidate field. When a judgment is denied, a face candidate field stops the judgment of being the face field of a backlight scene, and shifts to Step 136.

[0100] Moreover, when the judgment of Step 158 is affirmed, it shifts to Step 160, and the average concentration in the fuselage candidate field extracted by search of a fuselage candidate field is calculated, and a difference with the average concentration D_{area} in a face candidate field judges whether it is less than the predetermined value α . In addition, below, the judgment of Step 160 is called conditions f for convenience. Since it can judge that the extracted fuselage candidate field has high possibility that it is not a field equivalent to a person's fuselage if the picture of a processing object is assumed to be the picture of a backlight scene when the judgment of Step 160 is denied, the judgment of being the face field of a backlight scene is stopped, and it shifts to Step 136.

[0101] Moreover, when the judgment of Step 160 is affirmed, it shifts to Step 162, and the concentration contrast in a face candidate field and the extracted fuselage candidate field (or saturation contrast) is calculated respectively. And threshold Th_1 as which the contrast in a face candidate field and a fuselage candidate field was beforehand determined at the following step 164. It judges whether it is the following. In addition, below, the judgment of Step 164 is called conditions g for convenience. The judgment of Step 164 corresponds to the thing according to claim 1 "for which the accuracy as a field equivalent to the face of the person of a face candidate field is evaluated based on the contrast of the concentration in a face candidate field and the extracted fuselage candidate field, or saturation."

[0102] On the picture showing a backlight scene, while the contrast about the concentration in a face field (and saturation) becomes small, the contrast about the concentration in a fuselage field (and saturation) becomes small similarly. For this reason, since it can judge that the face candidate field which incorporated data at Step 122 has high possibility that it is not the face field of a backlight scene when the judgment of Step 164 is denied, a face candidate field stops the judgment of being the face field of a backlight scene, and shifts to Step 136.

[0103] Moreover, when the judgment of Step 164 is denied, it shifts to Step 166, and equivalent to the background in the picture which exists in the circumference of a face candidate field on the basis of a face candidate field like Step 182 of the stroboscope luminescence scene judging processing concerning the 1st operation gestalt, then the concentration distribution in the circumference field which set up the field (circumference field) presumed and was set up are calculated. As the concentration distribution (gray level histogram) of the background region in the picture showing a backlight scene is shown in drawing 8 (C) as an example, the configuration and bird clapper which the position of a peak deflected greatly to the low concentration side are

most, and the concentration distribution (refer to drawing 8 (A)) of the background region in the usual picture is greatly different. Although a part of low concentration field equivalent to a person's fuselage will be included as the above-mentioned circumference field is shown in drawing 7 (C) when a face candidate field is a face field of a backlight scene, since the area which this field occupies to a circumference field is small, a concentration distribution serves as a configuration as similarly shown in drawing 8 (C).

[0104] For this reason, at the following step 168, the biased degree by the side of the low concentration of the concentration distribution in the circumference field calculated at previous Step 166 judges whether it is more than a threshold. In addition, below, the judgment of Step 168 is called conditions h for convenience. The judgment of Step 168 corresponds to the thing according to claim 2 "for which the biased degree by the side of the low concentration of the concentration distribution in the field which exists in the circumference of a face candidate field also takes into consideration and evaluates the accuracy as a field equivalent to the face of the person of a face candidate field on a picture."

[0105] Since it can judge that the face candidate field which incorporated data at Step 122 has high possibility that it is not the face field of a backlight scene when the judgment of Step 168 is denied, the judgment of being the face field of a backlight scene is stopped, and it shifts to Step 188. Moreover, when the judgment of Step 168 is affirmed, after substituting 1 for a flag at Step 134, it shifts to Step 136.

[0106] Thus, in the backlight scene judging processing concerning a **** 2 operation gestalt, it replaced with the conditions a and b explained with the 1st operation gestalt, and the face candidate field has judged whether it is the face field of a backlight scene based on each conditions of Conditions a, f, g, and h. and when the face candidate field with which are satisfied of each aforementioned conditions exists, (when the judgment of Step 138 is affirmation) Judge the picture of a processing object to be the picture of a backlight scene (Step 146), and the face candidate field which does not fulfill each aforementioned conditions is excepted (Step 147). The direction of top and bottom is judged based on the direction where the fuselage candidate field corresponding to the face candidate field which fulfills each conditions exists (Step 149). According to the adjustment degree of the direction where the fuselage candidate field to the degree of agreement and the direction of top and bottom to each conditions exists, weight mark are respectively set up to each face candidate field (Step 151).

[0107] Thereby, like backlight scene judging processing in which it explained with the 1st operation gestalt, the picture of a processing object is a picture of a backlight scene, and weight mark high only about the face candidate field which is equivalent to the face field of a backlight scene though the field which is not a face field in fact is intermingled in a face candidate field can be set up.

[0108] Next, the stroboscope luminescence scene judging processing concerning a **** 2 operation gestalt is explained with reference to drawing 10. By this stroboscope luminescence scene judging processing, when the judgment of Step 180 is affirmed, the concentration contrast in a face candidate field and a fuselage candidate field (or saturation contrast) is respectively calculated at Step 202 (when the face candidate field fulfills Conditions c and Conditions d). And at the following step 204, it judges whether it is more than threshold Th2 (a threshold Th 2 is a high value beyond a predetermined value from the threshold Th 1 used for the judgment of Step 184 of the backlight scene judging processing concerning the 2nd operation gestalt) as which the contrast in a face candidate field and a fuselage candidate field was determined beforehand.

[0109] In addition, below, the judgment of Step 204 is called conditions j for convenience. The judgment of Step 204 also corresponds to the thing according to claim 1 "for which the accuracy as a field equivalent to the face of the person of a face candidate field is evaluated based on the contrast of the concentration in a face candidate field and the extracted fuselage candidate field, or saturation."

[0110] On the picture showing a stroboscope luminescence scene, while the contrast about the concentration in a face field (and saturation) becomes large, the contrast about the concentration in a fuselage field (and saturation) becomes large similarly. For this reason, since it can judge that the face candidate field which incorporated data at Step 122 has high possibility

that it is not the face field of a stroboscope luminescence scene when the judgment of Step 204 is denied, a face candidate field stops the judgment of being the face field of a stroboscope luminescence scene, and shifts to Step 188. Moreover, when the judgment of Step 164 is denied, after substituting 1 for a flag at Step 166, it shifts to Step 188.

[0111] Thus, in the stroboscope luminescence scene judging processing concerning a **** 2 operation gestalt, it replaced with the conditions c, d, and e explained with the 1st operation gestalt, and the face candidate field has judged whether it is the face field of a stroboscope luminescence scene based on each conditions of Conditions c, d, and j. and when the face candidate field with which are satisfied of each aforementioned conditions exists, (when the judgment of Step 190 is affirmation) The picture of a processing object is judged to be the picture of a stroboscope luminescence scene (Step 192). Except the face candidate field which does not fulfill each aforementioned conditions (Step 193), and the direction of top and bottom is judged based on the direction where the fuselage candidate field corresponding to the face candidate field which fulfills each conditions exists (Step 196). According to the adjustment d gree of the direction where the fuselage candidate field to the degree of agreement and the direction of top and bottom to each conditions exists, weight mark are respectively set up to each face candidate field (Step 198).

[0112] Thereby, like stroboscope luminescence scene judging processing in which it explained with the 1st operation gestalt, the picture of a processing object is a picture of a stroboscope luminescence scene, and weight mark high only about the face candidate field which is equivalent to the face field of a stroboscope luminescence scene though the field which is not a face field in fact is intermingled in a face candidate field can be set up.

[0113] In addition, you may make it change the weight mark P set as each face candidate field, the threshold THF for a face field judging, or the weight given to the concentration M of each face candidate field in the face field concentration Mface according to the kind of image processing performed using the processing result of face field extraction and concentration data processing.

[0114] For example, it sets to an image processor 40 using the extraction result of the face field by face field extraction and concentration data processing. Although it is dependent also on the grade of sharpness emphasis, or the kind of filter when sharpness emphasis processing in which the sharpness of a face field is emphasized covering an edge emphasis filter locally only to the extracted face field is performed Though emphasis of sharpness is performed also to the field which is not a face field in fact, a visual-sense top has a thing with a small (it is not conspicuous) bad influence. in such a case, threshold THF for a face field judging A value is made smaller than usual (namely, the criteria of selection of a face candidate field -- changing), and more face candidate fields may be made to judge to be a face field. Threshold THF for a face field judging Since the probability by which a misjudgment law is carried out will become low if the face candidate field corresponding to an actual face field is not a face field as a value is made low, by the above, it cannot leak to the face field in a picture, and sharpness emphasis processing can be performed.

[0115] Moreover, threshold THF for a face field judging More face candidate fields are able to replace with changing a value and to judge by what (that is, for the criteria of the evaluation to each face candidate field to be changed) the bigger value as weight mark P than usual is set up for to be a face field. Especially, as sharpness emphasis processing, when processing which strengthens the emphasis degree of sharpness is performed as the weight mark P become large, it also becomes possible to control the emphasis degree of sharpness strength by setting up the weight mark P as mentioned above.

[0116] Moreover, although it is dependent also on the grade of concentration amendment when amendment concentration amendment processing is locally performed in concentration for example, based on the face field concentration Mface only to the extracted face field using the extraction result of a face field and the face field concentration Mface by face field extraction and concentration data processing Though concentration amendment is performed also to the field which is not a face field in fact, a visual-sense top has a thing with a small (it is not conspicuous) bad influence. In such a case, threshold THF for a face field judging A value is

made smaller than usual and more face candidate fields may be made to judge to be a face field. Threshold THF for a face field judging Since the probability by which a misjudgment law is carried out will become low if the face candidate field corresponding to an actual face field is not a face field as a value is made low, by the above, it cannot leak to the face field in a picture, and concentration amendment processing can be performed.

[0117] Although the above-mentioned explanation is the case where an image processing with small influence is performed, in extraction of a face field when the field which is not a face field is accidentally extracted as a face field in fact conversely, when the image processing influenced [great when the field which is not a face field in fact is accidentally extracted as a face field] is performed For example, threshold THF for a face field judging Only the face candidate field where the accuracy as a face field is higher is able to be extracted as a face field by setting up the value smaller than usual as weight mark P in making a value larger than usual.

[0118] Moreover, the face field concentration M_{face} which can be found by previous (1) formula ((2) formulas are sufficient) also about face field concentration as shown, for example in the following (3) formulas Weighted-average-efficiency M_{face}' with other picture characteristic quantity D (for example, average concentration of the whole picture, average concentration of a non-face candidate field, etc.) When calculating however, (a weighting factor [as opposed to the face field concentration M_{face} in αF] and a weighting factor [as opposed to the picture characteristic quantity D in $\alpha 0$]) as face field concentration, The kind of image processing performed using the calculated face field concentration is embraced, and it is weighting-factor αF and $\alpha 0$. You may make it change the weight given to the concentration M of each face candidate field by what (that is, for the criteria of weighting to each face candidate field to be changed relatively) a value is changed for.

[0119]

$M_{face}' = \alpha F \cdot M_{face} + \alpha 0 \cdot D$ -- (3)

Moreover, although the above explained the case where calculated the processing conditions which include face field extraction and concentration data processing with the auto setup engine 44 based on press can image data, and the actual image processing to fine scan image data was performed by the image processor 40 It may be made to perform the image processing in the operation of processing conditions, and the calculated processing conditions in order not to the thing limited to this but to single image data, and may be made to perform these processings of a series of in the single processing section.

[0120] Furthermore, although extraction of a face field and the operation of face field concentration were respectively performed based on the weight mark set up to each face candidate field in the above, it is not limited to this and may be made to perform only either.

[0121] Moreover, although the image data obtained by reading the picture recorded on the photographic film above and the image data obtained by the image pick-up by the digital camera were made into the processing object, it is good also considering the image data obtained by reading the picture which is not limited to this and recorded on other record material, such as paper, or the image data generated by computer as a processing object. Moreover, this invention cannot be overemphasized by that the film picture recorded on the photographic film may be used for the determination of the exposure conditions at the time of carrying out exposure record by field exposure at printing paper.

[0122]

[Effect of the Invention] As explained above, a claim 1 and invention according to claim 4 Extract the face candidate field presumed, and equivalent to the face of the person in a picture, then when the concentration in a face candidate field is more than the 1st threshold or below the 2nd threshold A concentration difference with the face candidate field within the limits presumed that the field equivalent to the fuselage of the person who set up on the basis of the face candidate field exists The existence of the field below a predetermined value, Or since considerable, then the accuracy as a field which is equivalent to the face of the person of a face candidate field based on the contrast of the concentration in the fuselage candidate field presumed or saturation are evaluated on the inside of a face candidate field, and a person's fuselage When the concentration of the field equivalent to the face of the person in a picture is

deflecting to the high concentration or low concentration side, it has the outstanding effect that the field equivalent to a person's face can be judged with high precision.

[0123] In invention of a claim 1, when the concentration in a face candidate field is more than the 1st threshold, invention according to claim 2 The surface ratio of the field of each concentration region when dividing a picture into the field of the concentration region more than a three-stage, And since at least one side of the biased degree by the side of the low concentration of the concentration distribution in the field which exists in the circumference of a face candidate field on a picture is also taken into consideration and a face candidate field is evaluated It has the effect that the field equivalent to the face of the person who exists in the picture showing a backlight scene can be judged more to high degree of accuracy in addition to the above-mentioned effect.

[0124] In invention of a claim 1, when the concentration in a face candidate field is below the 2nd threshold, invention according to claim 3 Since the biased degree by the side of the high concentration of the concentration distribution in the field which exists in the circumference of a face candidate field on a picture is also taken into consideration and a face candidate field is evaluated It has the effect that the field equivalent to the face of the person who exists in the picture showing the scene which made the stroboscope emit light can be judged more to high degree of accuracy in addition to the above-mentioned effect.

[0125] That invention according to claim 5 is equivalent to the face of the person in a picture, then the 1st step which extracts the face candidate field presumed, When the concentration in a face candidate field is more than the 1st threshold or below the 2nd threshold A concentration difference with the face candidate field within the limits presumed that the field equivalent to the fuselage of the person who set up on the basis of the face candidate field exists The existence of the field below a predetermined value, Or it is based on the contrast of equivalent to the inside of a face candidate field, and a person's fuselage then the concentration in the fuselage candidate field presumed, or saturation. Since the program for making a computer perform processing containing the 2nd step which evaluates the accuracy as a field equivalent to the face of the person of a face candidate field was recorded on the record medium When the concentration of the field equivalent to the face of the person in a picture is deflecting to the high concentration or low concentration side, it has the outstanding effect that the field equivalent to a person's face can be judged with high precision.

[Translation done.]

* NOTICES *

Japan Patent Office is not responsible for any damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.

2.*** shows the word which can not be translated.

3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the outline block diagram of the image processing system concerning this operation gestalt.

[Drawing 2] It is the flow chart which shows the content of face field extraction and concentration data processing.

[Drawing 3] It is the flow chart which shows the content of the backlight scene judging processing concerning the 1st operation gestalt.

[Drawing 4] It is the flow chart which shows the contents of the stroboscope luminescence scene judging processing concerning the 1st operation form.

[Drawing 5] It is the conceptual diagram showing the search line for searching the high concentration field which exists in the circumference of a face candidate field.

[Drawing 6] It is the diagram in which (A) shows the usual picture and (B) shows an example of a concentration distribution of the picture of a backlight scene respectively.

[Drawing 7] When the direction of top and bottom is strange, (B) of (A) is [the conceptual diagram in which the direction of top and bottom shows respectively an example of the fuselage candidate area search range in the case of being known, and (C)] the conceptual diagrams showing an example of the circumference field for a concentration distribution operation.

[Drawing 8] (A) is the diagram showing respectively an example of the concentration distribution in a background region [in / the picture of a backlight scene / the usual picture and (B) and / in (C)] in the picture of a stroboscope luminescence scene.

[Drawing 9] It is the flow chart which shows the content of the backlight scene judging processing concerning the 2nd operation gestalt.

[Drawing 10] It is the flow chart which shows the content of the stroboscope luminescence scene judging processing concerning the 2nd operation gestalt.

[Description of Notations]

10 Image Processing System

14 Image Processing System

40 Image Processor

44 Auto Setup Engine

72 Information-Storage Medium

[Translation done.]

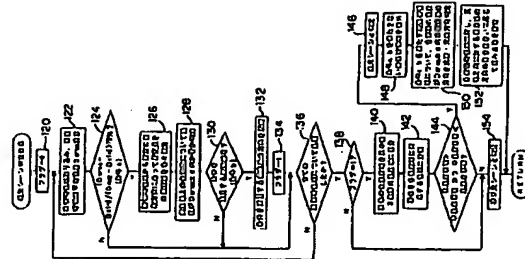
(51) Int.Cl. G 0 6 T 1/00 7/00	識別記号	特許平10-322380 平成10年11月12日(1998.11.12)	F 1 G 0 6 F 15/62 15/70 7-13-1 (3号) 5 B 0 5 7 3 3 0 Z 5 L 0 9 6 9 A 0 0 1
(21)出願番号 (22)出願日	特許平10-322380 平成10年11月12日(1998.11.12)	(71)出願人 000005201 富士フイルム株式会社 静岡県浜松市中区210番地 金城 直人 (72)発明者 神奈川県足柄上郡国成町宮台798番地 宮 士フイルム株式会社内 (73)代理人 100079049 井野士 中島 淳 (外3名) Fターム(3号) 5B057 D408 D802 D836 D034 D022 D025 5J036 A02 BA18 FA15 FA59 JA18 9A001 FF01 H023 H028 K042	出願番号 出願日 請求項の版 S O L (全 24 頁)

(54) 【発明の名称】 画像処理装置及び記録媒体

【57.】【要約】

【解説】 画像中の人物の顔に相当する領域の濃度が高温領域側又は低温領域側に偏倚している場合にも、人物の顔に相当する領域を高精度に判定する。

【解説手段】人物の顔に相当すると推定される顔領域は、顔域のうち、温度が低温側に偏倚している(12)が特徴的であり、温度が高温側に偏倚している(12)が背景である。温度が低温側にある顔領域は、顔領域の中心部から外周部にかけて温度が高くなる傾向があり、顔領域の外周部には、顔領域の中心部に比べて温度が低くなる傾向があることが判明した。また、顔領域の外周部には、顔領域の中心部に比べて温度が低くなる傾向があることが判明した。また、顔領域の外周部には、顔領域の中心部に比べて温度が低くなる傾向があることが判明した。



【待望請求の返答】

【請求項1】 画像データに基づいて、該画像データが表す画像中の人物の顔に相当すると推定される顔候補領域を抽出し、

[illegible][illegible]

【非特許事項3】 前記試験装置が前記領域内の速度の絶対値又は前記画像全体の前記速度 v の二乗に比例する前記試験領域内の速度の相対値を前記記憶部に記憶し、前記記憶部上での検索が前記記憶部に格納されている速度としての速度を、前記記憶部上で前記試験装置が前記領域内の速度として存在する領域における速度分岐点とすることを要する請求項1記載の試験処理方法。

【請求事項4】 前記データに基づいて、前記データが前記画像中の人物の顔面に相当すると判定される顔検出結果を抽出する他の手段と。

[illegible]

上に基つて、前記種族補綴屋の人物の感に相当する演
説としての制度を評価する評師手段と、
を含む演説型評置。

【請求項5】 画像データに基づいて、該画像データが表す画像中の人物の顔に相当すると判定される顔候補領域を抽出する第1のステップ、

第1日の図面は以上は前記第1の図面よりも所定傾斜1度低い傾斜の速度に於ける前記記憶領域内の速度の相対値が、第2日の図面は前記第1の図面よりも所定傾斜1度低い傾斜の速度に於ける前記記憶領域内の速度の相対値に相当するものが存在しているとして設定され、設定された範囲内における前記記憶領域は基準として設定し、設定した範囲内以下の領域の有無に基づいて、前記記憶領域の人物の顔に相当する領域として設定するかの処理を判断するか、又は前記記憶領域を基準として設定した範囲内で人物の顔に相当すると判定した人物の顔は領域を抽出し、前記記憶領域内及び抽出した人物の顔は領域内における速度又は角度のコントラスを小さくし、コントラスに基づいて、前記記憶領域の人物の顔に相当する領域と同一くその速度を算出する第2のステップを含む処理をコンピュータに実行させるためのプログラムが提供され、この記録媒体。

【免明の非難を駁明】

[1666]

【本明の願する技術分野】 本発明は画像処理方法、画像処理装置及び記録媒体に係り、特に、画像中の人物の顔に相当すると推定される領域を抽出する画像処理方法、該画像処理方法を用いる可能な画像処理装置、及び前記画像処理方法をコンピュータで実行させるためのプログラムが記載された記録媒体に関する。

[0002]

[illegible]

【0003】このため、画像中の人物の顔に相当すると判定される領域を抽出するための手法が採用されている。例えば特開第1-134925号公報には、画像データに基づいて、画像中に存在する人物の

各部に特有の形状パターン（例えば顔部の輪郭、瞳の輪郭、鼻の輪郭等）を形状パターン（*feature pattern*）と称し、抽出した形状パターンが、人物の所定部分の向れから、抽出した形状パターン（*feature pattern*）の大きさと人物の顔との位置関係に応じて、人物の顔に相当する領域としての整合性がない領域（候補領域）を決定すると共に、抽出した形状パターンと異なる他の形状パターンを探索し、先に決定した候補領域、人物の顔としての特徴性を評価し、人物の顔に相当すると推定される領域（候補）を抽出する領域法の抽出方法が図示されてい

【0004】しかし、画像上の顔領域の輝度（強度）は、顔像を表すシーンにおける人物の顔に対する照明条件によって大きく異なる、例えば逆光シーンを表す画像上では顔領域の強度は有意程度（低輝度）側に偏傾するが、ストロボ表を発生させたシーンを表す画像上では顔領域の強度は低強度（低輝度）側に偏傾する。画像から顔領域を抽出する従来の顔領域抽出方法では、何れも顔領域の強度が低強度側又は低強度側に偏傾するに依って顔領域の抽出精度が大幅に低下するといった欠点を有しておおる場合、顔像の背景領域が顔領域として抽出される。ことが頻りに発生していた。

【0005】また、特開平8-62741号公報には、両端を多価環のブロックに分別して二酸化し、「両端内面」の二つの多価環が逆光面像と逆光面像とで異なるというのび針終結に基づく、両部に異なる長さの逆光面像の強度と形状（分布）から逆光シークが活かすを判定すると共に、顔色の色度と両端から人物の存在を判定し、閉路補正を行うようにした閉路補正装置が開示されている。

【0006】しかしながら、カメラやデジタスチルカメラによって撮影された画像の殆どは天地方向が不特定かつ不明であるのに対し、上記技術は撮影ブロックの分布の判定に際して画像の天地方向が一定であることを前提としており、天地方向が不特定かつ不明の画像を処理する場台については何ら考慮されていない。従って、カメラやデジタスチルカメラによって撮影された殆どの画像については上記技術の適用が困難であるので、技術の適用に困難が伴いという欠点がある。また、逆光シーンを表す画像においては顔輪郭の影が低くなるので、逆光シーンを表す画像においては顔輪郭の判定精度も大幅に低下するということの問題もあった。

【0007】本発明は上記請求を考慮して成されたもので、画像中の人物の顔に相当する領域の速度が所定値以下、あるいは低遅延側に偏している場合にも、人物の顔に相当する領域を高精度に判定できる画像処理方法、画像処理装置及び記録媒体を得ることが目的である。

【0008】
【課題を解決するための手段】上記目的を達成するため

に請求項1記載の発明に係る画像処理方法は、画像データに基づいて、該画像データが表す画像中の人物の顔に相当すると推定された領域候補補正域を抽出し、抽出した領域候補補正域内の速度の絶対値又は顔面全体内の速度に引くする前記領域候補補正域内の速度の絶対値が、第1の閾値以下、又は前記第1の閾値よりも所定値以上低い第2の閾値以下の場合に、前記画像中の人物の顔体に相当する領域が存在しているとして推定された範囲を前記領域候補補正域として設定し、設定した範囲以下の前値に基づいて、前記領域候補補正域の人物の顔に相当する領域として設定した範囲内で人物の顔体に相当すると推定された領域候補補正域を抽出し、前記領域候補補正域及び前記抽出した領域候補補正域における速度又は顔面の顔に相当する領域としての速度を評価する。

【0009】請求項1記載の発明では、まず、画像データに基づいて、該画像データが及ぼす面内中の人物の顔に相当すると推定される顔領域補正を抽出する。この顔領域補正の抽出に際しては、従来より周知の任意のアルゴリズムを用いる可能である。次に抽出した顔領域補正域内の顔領域（顔領域補正域内の領域（又は程度）を代表する値である）は、よく、平均顔度、顔領域補正域内の顔領域の中央に相当する顔度、顔領域補正域内の領域（又は程度）の中心に相当する顔度等の何れを用いてもよい。を判定する。

【0010】ここで、抽出した顔検出領域内の顔度の絶対値又は顔全体顔度の顔度は、抽出した顔検出領域内の顔度の絶対値が第1の閾値以上の場合は、抽出した顔検出領域内の顔度が顔検出例に属している、抽出した顔検出領域内の顔度が逆光シーンにおける人物の顔に相当する顔度であるか、或いは人物の顔に相当する顔度以外の顔度が顔検出領域として認識された可能性がある（本明細書において、「顔度」はポジ顔度上での顔度を意味しており、例えば逆光シーンを表すネガ顔度上では人物の顔に相当する顔度は低強度側に属することは言うまでもない）。また、顔検出領域内の顔度の絶対値又は顔度全体顔度の顔度は抽出した顔検出領域内の顔度の絶対値が、第1の閾値よりも所定値以上低い第2の閾値以上の場合は、抽出した顔検出領域内の顔度が低強度側に属している、抽出した顔検出領域がストロボ逆光させたシーンの中で、抽出した人物の顔に相当する顔度であるか、或いは人物の顔に相当する顔度の顔度が顔検出領域として認識された可能性がある。

【0011】これに対し本発明者は、逆光シーンを表す画像やストロブを発生させたシーンを表す画像について検討した結果、これらのシーンでは人物の周体に対する照明条件が確に異なることとなることから、これらのシーンを表す画像上では、人物の顔に相当

する知識の近傍に存在する前記人物の顔面に相当する知識の道徳、温度コントラスト、彩度コントラストが、人物の顔に相当する知識の道徳、温度コントラスト、彩度コントラストと略同様の値を示す、という共通する特徴が有ることを見出した。すなわち、特定シーンを表す特徴像では、前記人物の顔面に相当する知識は、人物の顔に相当する知識の道徳と同様に、道徳が高温度度側に偏傾する。すなわち、温度コントラスト及び彩度コントラストが小さく、色に、温度コントラスト及び彩度コントラストが小さく、色となり、ストロボを発生させたシーンを表す特徴像では、人物の顔面に相当する知識は、人物の顔に相当する知識の道徳と同様に、道徳が高温度度側に偏傾すると共に、温度コントラスト及び彩度コントラストが大きく、色となることを見出した。

【0012】上記に基づき請求項1)の発明では、朝鮮補給地域域内の程度（絶対値又は相対値）が第1の閾値以上又は第2の閾値以下の場合に、当該域内の人物の団体と相当する朝鮮補給地域域に対する前値が存在していることと判定されている範囲を朝鮮補給地域域を評価する基準として設定し、設定した範囲内に基づいて、当該域との相対度差が所定値以下の前値の付帯に基づいて、朝鮮補給地域域の人物の顔に相当する前値としての前値を評価する。また、又は朝鮮補給地域域を基準として設定した範囲内では、朝鮮補給地域域内に相当する前値としての前値を評価する。人物の団体と相当する基準となる団体域を朝鮮補給地域域と抽出し、朝鮮補給地域域及び抽出した団体域を朝鮮補給地域域内における前値又は相対度のコントラストに基づいて、朝鮮補給地域域の人物の顔に相当する前値としての前値を評価する。

[illegible]

【0014】なお、画像中の人物の顔面に相当する領域が存在しているとは推定される範囲は、例えば天地方向が前後に存在すれば顔輪郭領域と人物の顔面に相当する領域が存在している、天地方向にのみ分布するように設定することができ、天地方向が未知であれば顔輪郭領域を中心として全周に亘って分布するように定めることができる。また、前記範囲の大きさは顔輪郭領域の大きさが大きくなくなるに従って大きくならなければならないことができる。

【0015】また、例えば断候熱領域内の温度（絶対値）

又は相対値)が第1の閾値以上であり、候補者領域内、及び候補者領域を基準として設定した範囲内で抽出した人物の顔体に相当すると判定される別候補者領域内における領域又は候補者のコントララストがそれぞれ第1の所定値以下である場合には、候補者領域は逆方向性において人物の顔に相当する領域である可能性が高く、候補者領域内の濃度(絶対値又は相対値)が第2の閾値以下であり、候補者領域内及び別候補者領域内における濃度又は候補者のコントララストがそれぞれ第2の所定値以上である場合には、候補者領域はスローガを発生させたシーンにおいて人物の顔に相当する領域である可能性が高確率であると判断できる。また、候補者領域及び別候補者領域の少なくとも一方が上記の条件を満たさない場合には、候補者領域は人物の顔に相当する領域ではない可能性が所高確率であると判断できる。

[0016]なお、画像中の人物の顔体に相当すると判定される領域について、従来より周知の任意のアルゴリズム、例えば特開平8-184972号公報に記載のアルゴリズム等を用いる可能である。

【0017】そして、図6は補正域の人物の顔に相当する領域としての高度の範囲は、上述した時間に基づき、人物の顔に相当する領域である可能性が高くなるに依つて、前記評価が高くなるように行うことができる。このように、請求項1の発明では、顔検出部及び物体検出部（トラスト）に基づいて、図6は補正域の人物の顔の領域を領域としての高度を評価するので、両者の間の顔の顔に相当する領域の高度が高度判定領域と高度値に比べて高い場合にも、人物の顔に相当する領域としての高度を評価することができ、精度向上に基づいて、人物の顔に相当する領域を高精度に判定（あるいは抽出）することができる。

【0018】請求項2記載の発明は、請求項1の発明において、前記近距離無線区域内の速度の絶対値又は前記近距離無線区域内の速度の絶対値が一定の速度の範囲に属する前記近距離無線装置の速度の絶対値が一定の速度に属する範囲以上の場合に、前記近距離無線装置の人物の顔に相当する範囲としての速度を、前記画像の速度越え検出速度に3段階以上の速度域に分け前記画像の速度域は、及び前記画像に分類したときの各速度域の速度の範囲値、及び前記画像上で前記近距離無線装置の範囲に存在する装置域における速度分布の近距離域への偏傾度についての少なくとも一方も考慮して評価することを特徴としている。

【0019】逆光シーンを表す画像では、前述のように、画像中の人物に相当する領域の強度が高強度域へ属し、人物と共に、画像中の背景に相当する領域の強度は低強度域へ属するので、例えば画像中の強度を3段階に分類し、以上の強度域に分け、画像を各強度域の領域に分割し、人物と、低強度域の領域及び低強度域の領域が小さく、他の広い領域を占め、中間強度域の領域が小さくなる。逆に、逆光シーンを表す画像中の人物の強

当する領域は、人物の顔面に相当する低速度の領域を除くと、周囲の大部分が背景に相当する低速度の領域に囲まれているので、人物の顔に相当する領域の周囲に隣接する領域内における速度分布は低速度側に偏倚する。

【0020】請求項2記載の発明では、逆光シーンを表す画像の上記特性を利用し、補画補領域内の速度（絶対速度）と逆光シーンにおける人物の顔に相当する領域の速度とを比較し、逆光シーンにおける人物の顔に相当する領域の速度が逆光シーンにおける人物の顔に相当する領域の速度よりも速い場合には、逆光シーンを表す画像中に存在する人物の顔に相当する領域を、より高精度に判定（抽出）することができる。

【0021】なお、逆光シーンを表す画像は、画像中の人物に相当する領域の速度が低速度側へ偏傾すると共に、画像中の背景に相当する領域の速度は低速度側へ偏傾すると、画像全体の速度分布（速度ヒストグラム）が現れ、中間速度域及び低速度域に各ピーク（山）が現れる。このため、前記の画像について計測するようになると、速度ヒストグラムの形状に差が生じて評価することができない。

【0022】請求項3記載の発明は、請求項1の発明において、前記配線領域内の導電性絶縁層又は前記絶縁層全体の導電性に対する前記配線領域内の導電性の相対比が、前記第2の絶縁層以下の場合に、前記配線領域の人物の顔に相当する領域としての価値を、前記絶縁層上で前記顔の輪郭領域の周囲に存在する領域における温度分布の偏り温度側への傾斜度よりも考慮して評価することを特徴と

【01023】ストロボを発光させたシーンでは、画像中の人物に相当する領域の強度が低照度側へ偏傾し、また画像中の背景に相当する領域の強度は高照度側へ偏傾することが多い。このため、ストロボを発光させたシーンを表す画像中の人物の領域に相当する領域は、人物の領域に相当する低照度の領域を除くと、周囲の大部分が背景に相当する高照度の領域に偏傾していることが多く、人物の分布は高照度の領域に存在する領域内における強度偏傾に偏傾することが多い。

[illegible]

存在する人物の顔に相当する領域を、より高精度に判定
(或いは抽出) することができる。

【0025】請求項4記載の発明に係る画像処理装置は、画像データに基づいて、該画像データを表す画像中の人物の顔と相当する位置として設定される顔候補領域を抽出し、抽出した顔候補領域内での速度の検知値又は前記顔候補領域全体に対する前記顔候補領域内の速度の相対値が、第1の閾値以上又は前記第1の閾値よりも所定値に上低い第2の閾値以下の場合には、前記画像中の人物の顔体に相当する領域が存在しているとして判定され、範囲における前記顔候補領域を基準として設定し、設定した範囲内における前記顔候補領域との速度差が所定値以下の人物の顔と相当する領域として設定した範囲内で人物の顔に相当する領域としてみなすことを特徴とする。また、前記顔候補領域の人物の顔に相当する領域として設定した範囲内における速度又は彩色のコントラストに基づいて、前記顔候補領域の人物の顔に相当する領域としてみなすことを特徴とする。

【0026】請求項5記載の発明に係る記録媒体は、画像データに基づいて、該画像データが表す画像中の人物の顔と相当する位置として設定される顔候補領域を抽出し、抽出した顔候補領域内の速度の検知値又は前記顔候補領域全体に対する前記顔候補領域内の速度の相対値が、第1の閾値以上又は前記第1の閾値よりも所定値に上低い第2の閾値以下の場合には、前記画像中の人物の顔体に相当する領域が存在しているとして判定される人物の顔と相当する領域として設定した範囲内で人物の顔に相当する領域としてみなすことを特徴とする。また、前記顔候補領域の人物の顔に相当する領域として設定した範囲内における速度又は彩色のコントラストに基づいて、前記顔候補領域の人物の顔に相当する領域としてみなすことを特徴とする。

【0027】請求項5記載の発明に係る記録媒体には、上記の第1のステップ及び第2のステップを含む処理、すなわち請求項1の発明に係る画像処理方法に係る処理をコンピュータに実行させるためのプログラムが記録されているので、コンピュータが前記記録媒体に記録されているプログラムを読み出して実行することにより、請求項1の発明と同様に、画像中の人物の顔に相当する

領域の濃度が高濃度側又は低濃度側に偏倚している場合にも、人物の顔に相当する領域を高濃度に変定（或いは抽出）することができる。

【0028】
【発明の実施の形態】以下、図面を参照して本発明の第
施形態の一例を詳細に説明する。

【0029】（第1実施形態）図1には、本発明が適用された画像処理システム10が示されている。画像処理システム10は、スキャナ12、画像処理装置14及びプリンタ16が直列に接続されて構成されている。

【0030】スキャナ12は、写真フィルム（例えば、ネガフィルムやリバーサルフィルム）等の写真感光材料（以下単に「写真フィルム」と称する）に記録されているフィルム面像（被写体を撮影後、現像処理することによって得られるネガ面像又はポジ面像）を読み取り、該読み取られたネガ面像又はポジ面像（以下、単に「面像」と取り扱う）によって得られた面像データを出力するものである。光學20から射出された光は、光軸方向にスクス22によって光軸方向から低減された光が、フィルムキャリア24にセットされているネガフィルムやリバーサルフィルム等の写真フィルム26に照射され、写真フィルム26を透過した光がレンズ28を介してCCDセンサ30（エリアセンサであったりラインセンサであってもよい）の受光面上に結像するように知られている。

【0031】フィルムキーパ24は、写真フィルム26上のフィルム画像が記録されている箇所が、光線20からの射出光の光軸に順に対応するように写真フィルム26を搬送する。これより、写真フィルム26に記録されているフィルム画像がCCDセンサ30によって順に読み取られ、CCDセンサ30からはフィルム画像に光変化する信号が出力される。CCDセンサ30から出力される信号はA/D変換器32によってデジタルの値に変換され、データに変換されて画像処理装置14に入力される。

【0032】画像処理装置14のラインスキャン補正部36は、入力されるデュータータ（スキャン12から入られるR、G、Bのデュータータ）から位置情報に対応するセルの出力レベルを算する暗減正。暗減正を行ったデータと速度係数をデュータータに比較乗する速度変換。等倍フィルム26を照らす光の出むらに応じて速度係数を変換するシェーディング補正。該シェーディング補正を行なったデータのうち射角値に対応し、多変数のデュータータを補正するシェーディング補正。該シェーディング補正を行なったデータのうち射角値に対応した信号が出力されないセル（所望範囲画素）のデュータータを周囲の画素のデュータータから推測して算出する欠陥画素補正部37に渡す。ラインスキャン補正部36で補正された出力は1/Oコントローラ38の入力端に接続され、また、ラインスキャン補正部38で前記各処理が行なわれていたデュータータはスキャンデュータとして1/Oコントローラ38に入力される。

【0033】1/0コントローラ38の入力端は、イメージプロセッサ40のデータ出力端にも接続されており、イメージプロセッサ40からは画像処理（ぼかしは後

述)が行われた例像データが力みされる。また、1/0
コントロール38の入力端はパーソナルコンピュータ4
2にも接続されている。パーソナルコンピュータ42は
拡張スロット(図示省略)を備えており、この拡張スロ
ットには、デジタルカメラカラム等によって例像データ
が書き込まれたデジタルカメラカラムに対してデータ
の読み出し/書き込みを行うドライバ(図示省略)が接続さ
れる。拡張スロットを介して外部からファイル例像データ
が入力された場合、力みされたファイル例像データは1/
0コントロール38へ入力される。

【0034】I/Oコントローラ38の出力端は、イメージアセンサ40のデータ入力端、シートセレクトアップエッジ44、パーソナルコンピュータ42に各々接続されており、更にI/F回路54を介してプリンタ16に接続されている。I/Oコントローラ38は、人力された画像データを、出力端に接続された伝送路等を通じて、逐行的に出力する。

【0035】本実施形態では、写真フィルム26に記録されている画素のフィルム面積に対し、スキヤナ12において異なる階調度の2画素の読み取りを行う。1画素の比較的低解像度の読み取り（以下、ブレスキャンという）では、フィルム側の歪度が非常に低い場合（例えば、フィルム側における露光アングルのネガ側像）にも、スキヤナ30で露光電極の読み取りが生じないよう決定した撮像素子（写真フィルム26に照射する光のR、G、Bの各波長域毎の光量、C/Dキャン30の露光時間）で写真フィルム26の全画素の読み取りが行われる。このブレスキャンによって得られたデータ（ブレスキャンデータ）は、1/0コントロール38からオートセクタアップエンジン44へ入力される。

【0036】 オートセットアップエンジン44は、CP
U46、RAM48（例えばDRAM）、ROM50
（例えば記憶内容を保持するROM）と、出力ポート
52を備え、これらを含めて互いに接続されて
構成されている。オートセットアップエンジン44は、
1/0コントローラ38から与えられたアドレスキャンデ
ークに基づいてフィルム画題のコマ位置を判定し、写真
フィルム26上のフィルム画題が領域に対比するデー
タ（アドレスキャンデーク）を抽出する。また、プレ
スキャン領域デークに基づいて、フィルム画題のサイズ
を判定すると共に領域等の画題位置を算出し、プレス
キャンを行った写真フィルム26と対し、スキャン12
と比較的画題度での画題の読み取り（以下、フアイ
ン）を行う際の読み取り条件を決定する。そし
てコマ位置及び採取条件をスキャン12に出力する。

【0037】また、オートセットアップエンジン44は、アドレスキャン画像データ（又は低解像度化したファイル画像データ）に基づいて、画像中の主要部（例えば人物の顔に相当する領域（顔検出）の抽出を含む画像特

被撮の演算を行い、スキヤナ12がファインスキヤンを
行うことによって得られるファインスキヤン画像データ
(又はファイン画像データ) に対する各種の画像処理の
処理条件を演算により自動的に決定し(セットアップ演
算)、決定した処理条件をイメージプロセッサ40へ出
力する。

【0038】 パーソナルコンピュータ42には、ディス
プレイ、キーボード、及びマウスが接続されている(例
えとして図示省略)。パーソナルコンピュータ42は、オー
ートセットアップエンジン44から低解像度の画像データ
を取出し、また、オートセットアップエンジン44によ
って決定された画像処理の処理条件を取出し、取り込
んだ処理条件に基づき、高解像度画像データを対象として
イメージプロセッサ40で行われる画像処理と等価な画
像処理を低解像度画像データに対して行ってシミュレ
ーション画像データを生成する。

【0039】 そして、生成したシミュレーション画像デ
ータを、ディスプレイに画像を表示するための信号に変
換し、該信号に基づいてディスプレイにシミュレーショ
ン画像を表示する。また、表示されたシミュレーション
画像に対しオペレータによって画質等の設定が行われ、
設定結果として処理条件の修正を指示する情報がキーボ
ードを介して入力される。これにより、オートセット
アップエンジン44へ出力する。これにより、オートセット
アップエンジン44では画像処理の処理条件の演算等
の処理が行われる。

【0040】 一方、スキヤナ12でフィルム画像に対し
てファインスキヤンが行われることによって1/Oコン
トローラ38から入力されたファインスキヤン画像データ
(又はファイン画像データ) は、1/Oコントローラ3
8からイメージプロセッサ40へ入力される。イメージ
プロセッサ40は、露光変換や色変換を含む色・濃度補
正処理、画質密度変換処理、画像の超低周波成分の
抑制を圧縮するハイパースペクトル処理、粒状を抑制しなが
らシャープネスを強調するハイパースペクトル処理等
の各種の画像処理を行う画像処理回路を各々備えてお
り、入力された画像データに対し、オートセットアップ
エンジン44によって各画像処理に決定されて通知された
処理条件に従って種々の画像処理を行う。

【0041】 イメージプロセッサ40で実行可能な画像
処理としては、上記以外に、例えば画像全体又は一部
(例えば人物の顔に相当する領域) に対するシャープネ
ス補正又はソフトフォーカス処理や、画像を自動的に変
更する画像処理(出力画像をモノトーンに仕上げる画像
処理、出力画像をポートレート風に仕上げる画像処理、
出力画像をセピア調に仕上げる画像処理等) や、画像を
加工する画像処理(例えば原画像中に存在する人物を主
画像として粗身に仕上げるための画像処理、赤目を修正
する画像処理等) や、L/F(レンズ付きフィルム)によ
って撮影された画像に対し、L/Fのレンズの歪曲収差、倍

率色収差に起因する画像の幾何学的歪み、色ずれを補正
するL/F収差補正処理や、L/Fのレンズの周辺減光に起
因する画像の周辺部の明度低下を補正する周辺減光補正
処理や、L/Fのレンズの特性に起因する画像の解像度の
低下を補正するポイントボク補正処理等のように、L/Fの
レンズの特性に起因する出力画像の歪みの低下を補正す
る各種のL/F収差補正処理等が挙げられる。

【0042】 イメージプロセッサ40で画像処理が行わ
れた画像データを印刷装置への画像の記録に用いる場合に
は、イメージプロセッサ40で画像処理が行われた画像
データを、1/Oコントローラ38からI/F回路54
を介して記録用画像データとしてプリンタ16へ出力され
る。また、画像処理後の画像データを画像ファイルとし
て外部へ出力する場合は、1/Oコントローラ38から
パーソナルコンピュータ42に画像データが出力され
る。これにより、パーソナルコンピュータ42では、外
部への出力用として1/Oコントローラ38から入力さ
れた画像データを、拡張スロットを介して画像ファイル
として外部(例えばCD-R等の情報記憶媒体に画像デ
ータを格納する装置や、通信制御装置を介して接続
された他の情報処理装置等) に出力する。

【0043】 プリンタ16は、画像メモリ58、R、
G、Bのレーザ光源60、該レーザ光源60の作動を制
御するレーザドライバ62を備えている。画像処理装置
14から入力された記録用画像データは画像メモリ58
に一旦記憶された後に読み出され、レーザ光源60から
射出されるR、G、Bのレーザ光の差動に用いられ、
レーザ光源60から射出されたレーザ光は、ポリゴンミ
ラー64、fθレンズ66を介して印刷紙68上を走査
され、印刷紙68に画像が露光記録される。画像が露光
記録された印刷紙68は、プロセッサ部18へ送られて
彩色記録、漂白定着、水洗、乾燥の各処理が施される。
これにより、印刷紙68に露光記録された画像が可視化
される。

【0044】 次に本実施形態の作用として、スキヤナ1
2から画像処理装置14にプレスキヤンデータが入力さ
れ、オートセットアップエンジン44において、プレス
キヤンデータからの画像データの切り出し等の処理を行
った後で行われる領域抽出・濃度補正処理について説
明する。

【0045】 本実施形態に係る領域抽出・濃度補正処
理(後述する浸水シエン判定処理及びヒストロビ光シ
エン判定処理を含む)は、請求項1の発明に係る画像処理
方法が適用された処理であり、オートセットアップエ
ンジン44のCPU44により、領域抽出・濃度補正プ
ログラムが実行されることにより実現される。領域抽出
プログラムが実行されることにより、濃度補正・濃度補正
プログラムと併せて、該補正の領域のうち人物の顔に相
当する領域を推定し、推定した領域を領域補正域として
抽出する(特開平4-346339号公報参照)。

ているが、CD-R/DVやメモ리카ード等の他の情報記
憶媒体で構成してもよい。パーソナルコンピュータ42
に接続された情報記憶装置(図示省略)に情報記憶媒体
72が接続され、情報記憶媒体72から画像処理装置1
4へのプログラムの格入(インストール)が指示される
と、情報記憶装置によって情報記憶媒体72から領域補
正・濃度補正プログラム等が読み出され、記憶内容を
再読可能なROM50に記憶される。

【0046】 そして、領域抽出・濃度補正処理を実行
すべきタイミングが到来すると、ROM50から領域補正
プログラムが読み出され、領域補正プログラムがCPU46
によって実行される。これにより、オートセットアップエンジン44は請求項
4の発明に係る画像処理装置として機能する。このよう
に、領域抽出・濃度補正プログラム等を記憶している
情報記憶媒体72は請求項5に記載の情報記憶媒体に対応し
ている。

【0047】 以下、領域抽出・濃度補正処理につい
て、図2のフローチャートを参照して説明する。ステッ
プ100では、処理対象の画像データに基づき、画像デ
ータが表す画像から、画像中の人物の顔に相当すると推
定される領域(領域補正域)を抽出する領域補正域抽出
処理を行う。この領域補正域抽出処理を行うための抽出
方式としては、画像中の人物の顔に相当すると推定され
る領域を判断し、該領域を領域補正域として抽出する領
域補正域抽出方式や、画像中の背景に相当すると推定さ
れる領域(背景領域)を判断し、背景領域以外の領域を
領域補正域として抽出する背景領域除去方式等があり、具
体的には、従来より公知の、下記のような領域補正域抽
出方式、背景除去方式のうちの少なくとも何れかを採用し
て、領域補正域抽出処理を行うことができる。

【0048】 (領域補正域抽出方式の例1) 画像を多数
の判定点に分けずると共に各判定点をR、G、Bの3色
に基づいて、各判定点が色相値として何色の範囲内に含ま
れているかを否か判定し、何色の範囲内と判断した判定点の
クラスク(群)が存在している領域を領域補正域として
抽出する(特開昭52-15624号公報、特開昭52-15625
号公報、特開昭53-12330号公報、特開昭53-145620号公
報、特開昭53-145621号公報、特開昭53-145622号公報
等参照)。

【0049】 (領域補正域抽出方式の例2) 前記画像デ
ータに基づいて、色相値(及び彩度値)についてのヒス
トグラムを求め、求めたヒストグラムを画像に分割し、
各判定点が分割した山の何れに属するかを判断して各画
素を分割した山に対応する群に分け、各群毎に画像を
判定点を分割した山に对应する群に分けて、該補正の領域のうち人物の顔に
相当する領域を推定し、推定した領域を領域補正域として
抽出する(特開平4-346339号公報参照)。

【0050】 (領域補正域抽出方式の例3) 前記画像デ

ークに基づいて、画像中に存在する人物の各部分に特有の
形状パターン(例えば顔部の輪郭や髪の特徴等を表す形
状パターン等)の何れか一つを探索し、検出した形状パ
ターンの人まき、向き、検出した形状パターンが表す人
物の所定部分と人物の顔との位置関係に依りて、人物の
顔に相当すると推定される領域を推定する。また、検出
した形状パターンと真なる顔の形状パターンを照らし、
先に設定した領域の、人物の顔としての適合性を求め、
領域補正域を抽出する(特開平8-122944号公報、特開平
8-18925号公報、特開平9-138171号公報等参照)。

【0051】 (領域補正域抽出方式の例4) 前記画像デ
ータに基づいて、画像中の各部分における濃度又は色の
変化量を各方向に求め、基準点を推定すると共に、該
基準点に対し、探索範囲及び該探索範囲内の各部分にお
ける探索すべき濃度又は色の変化方向を表す探索方向
パターンを各部分の境界形状に依りて設定し、前記探索
範囲内に存在するか前記探索方向パターンが表す方向に
沿って濃度又は色の変化量が所定値以上の箇所を探索
し、探索条件を満たす箇所を抽出した場合に該箇所を
次の基準点として推定することを繰り返して、前記基準点
として設定した画像中の領域の境界形状を結んで成る領
域を、領域補正域と判断して抽出することによ
り、領域補正域を抽出する(特開平9-138171号公報等参
照)。

【0052】 (背景領域除去方式の例1) 前記画像デー
タに基づいて、各判定点が、色相値として明らかに背景に属
する特定の色(例えば空や海の色、芝生や木の緑等)の色
範囲内に含まれているかを否か判定し、前記特定の色の範
内と判断した判定点のクラスク(群)が存在している領
域を背景領域と判断して除去し、残った領域を背景補正
域(人物の顔に相当する領域が含まれている可能性の低
い領域; これも本発明の領域補正域)として抽出する。

【0053】 (背景領域除去方式の例2) 前記画像デー
タに基づき、先の主要部抽出方式の例2と同様にして画像
を複数の領域に分割した後に、各領域毎に背景に相当す
る領域としての特徴点(例えば含まれる画素成分の比
率、線形特徴、凹凸度、画像外縁との距離等、領域の少
数のコントラスト、領域内の濃度の変化パターンの有無
等)を求め、求めた特徴点に基づいて各領域が背景領域
かを否か判定し、背景領域と判断した領域を除去し、残った領
域を背景補正域(領域補正域)として抽出する(特開平
8-122944号公報、特開平8-18925号公報等参照)。

【0054】 なお上記の抽出方式は単なる一例であり、
画像から人物の顔に相当すると推定される領域を抽出す
る抽出方式であれば、どのような方式であっても適用可
能であることは言うまでもない。またステップ100で
は、多数回の抽出方式を各々適用して領域補正域抽出処
理を複数回行ってよい。単一の抽出方式で処理条
件を各々変えて領域補正域抽出処理を複数回行ってよ
い。なお、ステップ100は請求項4に記載の抽出手段

に対応している。

【0055】次のステップ102では逆光シーン判定処理を行う。以下、この逆光シーン判定処理について、図3のフローチャートを参照して説明する。ステップ120ではフラグを0に初期設定する。ステップ122では、先のステップ100の領域補補域抽出処理によって抽出された領域補補域の中から単一の領域補補域のデータを取り込み、領域補補域内の平均速度Dareaを算出する。次のステップ124以降では、データを取り込んだ領域補補域が逆光シーンを表す画像中の人物の顔に相当する領域（以下、単に「逆光シーンの領域」と称する）かを判定する。

【0056】すなわち、ステップ124では処理対象の画像の最大速度Dmax及び最小速度Dminを求めた後、領域補補域内の平均速度Dareaが、式によって規定される条件（便宜的に条件aという）を満たしているかを判定する。

$$(Darea - Dmin) / (Dmax - Dmin) > 75\%$$

上記の条件式の左辺は、処理対象の画像全体の速度に対する領域補補域内の速度（平均速度）の相対値を表しており、右辺の数値は左辺に係する第1の閾値に対応している。なお、領域補補域内の速度の相対値に代えて領域補補域内の速度の絶対値を用い、該速度の絶対値を所定値（第1の閾値）と比較することでも上記処理を行うようにしてもよい。

【0057】ステップ124の判定が否定された場合には、領域補補域内の速度が高閾値側（低速度側）に偏しているか、ステップ122データを取り込んだ領域補補域は、逆光シーンの領域ではないと判断できるとして、ステップ124の判定が否定された場合には逆光シーンの領域補補域が否かの判定を中止し、ステップ136へ移行する。

【0058】一方、ステップ124の判定が肯定された場合にはステップ126へ移行し、領域補補域を中心として所定の複数の方向へ放射状に延びる所定長さの探索線（例として図5に示す放射線）を各々設定する。なお、この探索線は、領域補補域が逆光シーンの領域と仮定して人物の顔に相当する領域（逆光シーンの領域）を探索するためのものである。探索線の長さには、例えば領域補補域の長手方向長さの2倍程度とすることができ。

【0059】また、処理対象の画像の天地方向が既知であるならば、領域補補域に対して領域補補域が存在している可能性がある方向に限る。天地方向に基づき領域補補域が存在している可能性がある方向に沿ってのみ探索線を設定するようにしてもよい。なお天地補補域は、例えば処理対象の画像データが、磁気層が形成されたフィルムに記録されている画像を読み取ることによって得られた画像データである場合には、画像の撮影記録時等のタイミングで写真フィルムの磁気層に磁気記録された

いることが多く、このような場合には、磁気層に磁気記録されている情報を磁気的に読み取ることによって天地情報を取得することができ。

【0060】次のステップ128では、ステップ126で設定した探索線128の全ての画像について、領域補補域内の平均速度Dareaとの差が所定値α以内か否かを各々判定する。なお所定値αは、例えば速度値が8ビットのデータ（2⁸=256）によって0～255の値で表されることとすると、「20」程度の値を用いることができる。そして、ステップ130では「探索線上の全画像の速度がDarea±α内」という条件を満たす探索線があるかを判定する。

【0061】なお、以下ではステップ130の判定を便宜的に条件bという。ステップ130の判定は、請求項1に記述の「画像中の人物の顔に相当する領域が存在している」と推定される範囲（探索線を設定した範囲）内における領域補補域との速度差が所定値以下の領域の有無に基づいて、領域補補域の人物の顔に相当する領域としての領域を詳細する」ことに対応している。

【0062】逆光シーンを表す画像では領域補補域と同様に領域補補域の速度も高速度側に偏する。従って、ステップ130の判定が否定された場合には、何れの探索線も速度が高速度域に偏している領域に掛かっておらず、領域補補域の周囲には逆光シーンの領域領域である可能性のある領域が存在していないと判断できるので、逆光シーンの領域補補域が否かの判定を中止し、ステップ136へ移行する。また、ステップ130の判定が肯定された場合にはステップ132へ移行し、速度が高速度域に偏している領域に掛かっている探索線、すなわち探索線128上の全画像の速度がDarea±α内の探索線（例えば図5において下方に延びている探索線）について、探索線の延びる方向を記憶する。そして、次のステップ136で、フラグに1を代入し、ステップ136へ移行する。

【0063】ステップ136では、領域補補域抽出処理（ステップ100）によって抽出された全ての領域補補域に対してステップ122以降の処理・判定を行ったか否かを判定する。判定が否定された場合にはステップ12に限り、前記判定が肯定された逆光シーン122～136を繰り返す。これにより、全ての領域補補域に対し逆光シーンの領域補補域が否かが判定されることとなる。そして、ステップ136の判定が肯定されるとステップ138へ移行する。

【0064】ステップ138ではフラグが1か否かを判定する。ステップ138の判定が否定された場合、条件a（ステップ124の判定）及び条件b（ステップ130の判定）を満たす領域補補域が存在していないので、処理対象の画像は逆光シーンを表す画像ではないと判断できる。このため、ステップ154で処理対象の画像は逆光シーンを表す画像と判定し、逆光シーン判定処理を終了する。また、ステップ138の判定が肯定された場合は、

台には、処理対象の画像は逆光シーンを表す画像である可能性があるので、ステップ140で処理対象画像の全速度域を3段階の速度域に区分し、次のステップ140で処理対象の画像を各速度域に対応する領域に区分する。

【0065】通常、画像（非逆光シーンを表す画像）の速度分布（速度ヒストグラム）は、速度域等の主要部の速度が適正な速度となることにより、例として図6（A）に示すように中間速度域にピークが現れる形状となる。これに対し、逆光シーンを表す画像は速度域等の主要部の速度が高速度側に偏し、背景領域の速度が低速度域（高速度側）に偏することにより、例として図6（B）に示すように高速度域及び低速度域に各々ピークが現れる形状となる。画像上の各速度域における各領域の面積は、速度ヒストグラムにおける各速度域の累積度数に比例するので、図6（A）と図6（B）を比較しても明らかに、逆光シーンを表す画像は中間速度域に対応する中間速度域の面積が非常に小さいという特徴を有している。

【0066】このため、次のステップ144では、低速度域に対応する低速度域の面積が中間速度域の面積よりも広く、かつ高速度域に相当する高速度域の面積が中間速度域の面積よりも広い、か否か（すなわち（低速度域面積）×（中間速度域面積）×（高速度域面積）の積が中間速度域の面積の2乗より大きい、か否か）を判定する。先のステップ140で区分する速度域は、ステップ144の判定が可能であるか否か、処理対象画像の速度域を4以上の多数の速度域に区分してもよい。ステップ144の判定は、請求項2に記述の「領域補補域の人物の顔に相当する領域としての領域を、画像の全速度域を3段階以上の速度域に分け画像を各速度域の領域に分割し、各速度域の領域の面積比も考慮して詳細する」ことに対応している。

【0067】ステップ144の判定が肯定された場合には、処理対象の画像全体の速度分布が逆光シーンを表す画像に特有の速度分布と相違しており、処理対象の画像は逆光シーンを表す画像でない可能性が高いので、ステップ154で処理対象の画像は非逆光シーンを表す画像と判定し、逆光シーン判定処理を終了する。

【0068】一方、ステップ144の判定が否定された場合は、条件a及び条件bを満たす領域補補域が存在し、かつ処理対象の画像全体の速度分布も逆光シーン146で処理対象の画像は逆光シーンを表す画像と判定する。次のステップ148では、領域補補域抽出処理によって抽出された領域補補域の中に、条件a及び条件bを満たさない領域補補域があれば、該領域補補域を除外する。ステップ150では、条件a及び条件bを満たす領域補補域（ステップ144で除外された領域補補域）における条件bを満たした探索線

（探索線上の全画像の速度がDarea±α内であった探索線）の延びる方向を比較し、画像の天地方向を判定する。

【0069】この判定は、例えば条件bを満たした探索線の延びる方向が一致している領域補補域の数を各方向毎に算出し、領域補補域の数が最多の方向を天地方向と判定することで行うことができる。またステップ150では、各領域補補域の中に、条件bを満たした探索線の延びる方向が偏在した天地方向と大きく異なる領域補補域があれば、該領域補補域を除外する。

【0070】そして、次のステップ152では、各領域補補域に対し、ステップ150で判定した天地方向に対する条件bを満たした探索線の延びる方向の割合を算出する（一致割合）。一致割合に応じて重み係数を各々設定する。なお、この重み係数は領域補補域の人物の顔に相当する領域としての速度を評価する評価値に対応しており、ステップ152はステップ124、130、144の判定と共に請求項4に記述の処理手段に対応している。

【0071】上記の逆光シーン判定処理により、処理対象の画像が逆光シーンの画像であり、領域補補域の中に実際に領域補補域ではない領域が存在していたとしても、逆光シーンの領域に相当する領域補補域についてのみ高い重み係数を設定することができる。ステップ152の処理を行うと逆光シーン判定処理を終了し、図2のフローチャートのステップ104へ移行する。

【0072】ステップ104では、前述した逆光シーン判定処理において、処理対象の画像が逆光シーンを表す画像と判定されたか否かを判定する。判定が肯定された場合にはステップ112へ移行するが、判定が否定された場合にはステップ106へ移行し、ストロボ発光シーン判定処理を行う。以下、このストロボ発光シーン判定処理について、図4のフローチャートを参照して説明する。

【0073】ステップ170ではフラグを0に初期設定する。ステップ172では、領域補補域抽出処理によって抽出された領域補補域の中から単一の領域補補域のデータを取り込み、領域補補域内の平均速度Dareaを算出する。次のステップ174以降では、データを取り込んだ領域補補域がストロボを発生させたシーンを表す画像中の人物の顔に相当する領域（以下、単に「ストロボ発光シーンの領域」と称する）かを判定する。

【0074】すなわち、ステップ174では処理対象の画像の最大速度Dmax及び最小速度Dminを求めた後、領域補補域内の平均速度Dareaが、式によって規定される条件（便宜的に条件cという）を満たしているかを判定する。

$$(Darea - Dmin) / (Dmax - Dmin) < 25\%$$

上記の条件式の左辺は、処理対象の画像全体の速度に対する領域補補域内の速度（平均速度）の相対値を表しており、右辺の数値は左辺に係する第2の閾値に対応して

ジプロセッサ40で実行される各処理の前後処理の処理条件を決定するが、処理結果抽出・追加処理の処理結果の一部の前後処理の条件に利用される。例えば、例えばは先のステップ112で抽出された追加処理は、イメージプロセッサ40で実行される処理は、その一部のみを対象とした前後処理（例えばは追加処理に対するシャープネス補正や赤目補正等）の条件に利用され、前記追加処理が設定された処理のまゝ、先のステップ114で処理された追加処理の結果は、例えばはイメージプロセッサ40で実行される前後処理を対象とした前後処理（例えばは色・速度補正）に利用され、例えばは追加処理は追加処理が所定処理になるように追加補正条件の処理条件が決定される。

【0095】先に説明したように、本第1実施形態では、処理対象の画像が逆光シーンの画像か否かを条件a, b, cに基づいて判定し、逆光シーンの画像でなかった場合にはストロボ発光シーンの画像かを条件c, d, eに基づいて判定しているので、処理対象の画像が逆光シーンの画像、故にはストロボ発光シーンの画像でなく、破滅補正域追加処理における対象には破滅補正域でない領域が選定されているとしても、前述した条件により誤抽出された領域に高い重み係数が設定されることはなされない。抽出された領域に高い重み係数が設定されて加算される確率が大幅に低減されること共に、実際には破滅補正域でなく、破滅補正域の温度によって破滅補正域が大幅に変化することも防止することができ、

【0097】従って、顔領域の抽出結果又は顔領域抽出度とFaceを利用して処理条件が算出される名画像処理に対しても適正な処理条件が得られ、フェイスキャン画像データを対象としてイメージプロセス40で実行される名画像処理についても適正な処理結果が得られる。

【0098】（第2実施形態）次に本発明の第2実施形態について説明する。なお、第2実施形態は第1実施形態と同一の構成であるので、各部分に同一の符号を付けて構成の説明を省略し、以下、第2実施形態の作用について、第1実施形態と異なる部分についてのみ説明する。

【0099】本第2実施形態では、第1実施形態で説明した逆光シーム判定処理(図3)に代えて、図6に示すような逆光シーム判定処理が行われる。この逆光シーム判定処理では、ステップ124の判定が肯定された場合(即ち逆光シーム候補領域が存在する)、図7に示すように、逆光シーム判定処理は、ステップ124の判定が肯定された場合(即ち逆光シーム候補領域が存在する)にステップ176と同様に、順次候補抽出を行へば行い、第1実施形態に係るストロボ発光シーンスケジュールを決定して順次候補領域を探索する。次のステップ185では、同候補領域探索と判断できたら候補があったかを判定し、肯定ならば順次候補が逆光シームの候補であると判定された場合には、順次候補領域が逆光シームの候補であると判定されたと見做される。

否かの判定を中止し、ステップ136へ移行する。

【0100】また、ステップ158の判定が肯定された場合にはステップ160へ移行し、団体候補領域の探索によって抽出された団体候補領域内の平均速度を算出し、領域候補域内の平均速度Darenとこの速度を比較し、領域候補域を決定する。なお、ここではステップ160の判定が肯定を便宜的に条件「1」とし、ステップ160の判定が否定された場合には、処理対象の画像を逆光シーンの画像と仮定すると、抽出した団体候補領域は人物の団体に相当する領域でない可能性があると判断できるので、逆光シーンの領域が吾々の判定を中止し、ステップ136へ移行する。

【0101】また、ステップ160の判定が肯定された場合にはステップ162へ移行し、領域補正域内及び抽出した閉体候補領域内の重畳コンラスト（又は彩色コンラスト）を各々算出する。そして、次のステップ164では、領域補正域内及び閉体候補領域内のコントラストが予め定められた閾値TH1以下に否かと判定する。なお、以下ではステップ164の判定を便宜的に条件gという。ステップ164の判定は、請求項1に記載の「領域補正域内及び抽出した閉体候補領域内における重畳又は彩色のコントラストに基づいて、領域補正域の判定に相当する領域としての判定を遂行する」ことに対応している。

【0102】逆光シーンを表す画像上では、領域内での過渡（及び彩度）についてのコントラストが小さくなることと、隣接領域内の過渡（及び彩度）についてのコントラストは、ステップ16の判定が肯定された場合には、ステップ122でデータを取り込んだ領域補填度は逆光シーンの領域でない可能性が高いと判断できるので、領域補填度が逆光シーンの領域か否かの判定を中止し、ステップ136へ移行する。

【0103】また、ステップ164の判定が否定された場合にはステップ166へ移行し、第1実施形態に係るストロボ光シエーン判定処理のステップ182と同様に、顔検出結果を基準として顔検出領域の周囲に存在する画素の特性に相当すると判定された領域（図10(a)の領域）を設定し、設定した周囲領域内における強度分布を計算する。逆光シエーンを表す画像における背景領域の強度分布（強度ヒストグラム）は、例として図8（C）にも示すように、ピークの位置が低強度側へ大きく偏傾した形状となることが殆どであり、通常の画像における背景領域の強度分布（図8（A）参照）とは大きく相違している。顔検出領域が逆光シエーンの領域であった場合、前述の周囲領域は図7（C）にも示すように人物の顔には相当する低強度領域を一部含むことになるが、該領域が逆光シエーン領域に占める面積は小さく、強度分布は同様に図8（C）に示すような形状となる。

【0104】このため、次のステップ168では、先の

されるようにしてもよい。顔検出判定用の閾値 T_H の値を低くすると従って、実際の顔検出域に比して低くなる顔検出域が顔検出域でないとして判定される確率が低くなる。以上により、画像中の顔検出域に比して低くなるシャープネス強調処理を施すことができる。

【0115】また、顔検出判定用の閾値 T_H の値を変更することによって、重み点 P として通常よりも大きな値を決定する(すなわち各顔検出域に対する評価の基準を変更する)ことで、より多くの顔検出域が顔検出と判定されるようにすることも可能である。特にシャープネス強調処理によって、重み点 P が大きくなるに従ってシャープネスの強調度合いが強くなる処理が行われる場合には、重み点 P を上記のように設定することでシャープネスの強調度合いを強めにコントロールすることも可能となる。

【0116】また例えば、顔検出域抽出・速度算処理による顔検出域の抽出結果及び顔検出域速度 $Mface$ を利用して、抽出された顔検出域に対してのみ顔検出域速度 $Mface$ に基づき局所的に速度を補正する速度補正処理が行われる場合、速度補正の程度にも依存するが、実際には顔検出域内、顔検出域の速度を補正する速度補正処理が行われるべき部分にのみ速度補正が行われることが多く、このようにして顔検出域内にも速度補正が行われたとしても視覚上は感度が高い(目立たない)ことがある。このように場合には、顔検出判定用の閾値 T_H の値を通常よりも小さくし、より多くの顔検出域が顔検出と判定されるようにしてもよい。顔検出判定用の閾値 T_H の値を低くすると従って、実際の顔検出域に比して低くなる顔検出域が顔検出と判定されるようにしてもよい。

また、上記ではブレースキャン画像データに基づきポートセットアップエンジン44によって顔検出域抽出・速度算処理を含む処理条件の算出を行い、ファインスキャン画像データに対する処理条件の算出はイメージプロセッサ44で行う場合を説明したが、これに限定されるものでなく、単一の画像データに対して処理条件の算出、算出した処理条件での画像処理を行うようにしてもよく、これらの一連の処理を単一の処理で行うようにしてもよい。

【0120】更に、上記では各顔検出域に対して設定した重み点 P に基づき、顔検出域の抽出及び顔検出域速度の算出を行っていたが、これに限定されるものではなく、何れか一方のみを行うようにしてもよい。

【0121】また、上記では写真フィルムに記録された画像を読み取ることで得られた画像データやデジタルカメラによる撮像によって得られた画像データを処理対象としていたが、これに限定されるのではなく、感写剤他の記録材料に記録された画像を読み取ることで得られた画像データ、或いはコンピュータによって生成された画像データを処理対象としてもよい。また、本発明は写真フィルムに記録されたフィルム画像を顕微鏡により印刷紙に感光記録する際の感光条件の決定に利用してもよいことは言うまでもない。

領域でないとして誤判定される確率が低くなるので、上記により、画像中の顔検出域に比して低くなる顔検出域を抽出することができる。

【0117】上記の説明は、顔検出域の抽出において、実際に顔検出域でない領域を抽出して顔検出域として抽出した場合にも影響が小さい画像処理が行われる場合であるが、逆に実際に顔検出域でない領域を抽出して顔検出域として抽出した場合に多大な影響を受ける画像処理が行われる場合には、例えば顔検出判定用の閾値 T_H の値を通常よりも大きくしたり、重み点 P として通常よりも小さな値を設定することで、顔検出域としての領域がより少ない顔検出域のみが顔検出域として抽出されるようになることも可能である。

【0118】また、顔検出域速度についても、例えば次の(3)式に示すように、先の(1)式(2)式で求めた顔検出域速度 $Mface$ と、他の画像特徴量 D (例えば画像全体の平均勾配、非顔検出域の平均勾配等)との加重平均値 $Mface'$ (但し、 α_1 は顔検出域速度 $Mface$ に対する重み係数、 α_2 は画像特徴量 D に対する重み係数)を利用して算出する場合、算出した顔検出域速度を補正して行われる画像処理の特性に応じて、各顔検出域の速度 M に付与する重みを変更する。ここで、各顔検出域の速度 M に付与する重みを変更するようにしてもよい。

$$M' = \alpha_1 \cdot Mface + \alpha_2 \cdot D \quad \dots (3)$$

【0122】

【発明の効果】以上説明したように請求項1及び請求項4記載の発明は、画像中の人物の顔に相当すると推定される顔検出域を抽出し、顔検出域内の速度が第1の閾値以上又は第2の閾値以下の場合に、顔検出域を基準として判定した人物の顔に相当する領域が存在しているとして判定される範囲内における顔検出域との速度差が所定値以下の領域の有無、又は顔検出域内及び人物の顔に相当すると推定される顔検出域内における速度又は速度のコントラストに基づいて、顔検出域の人物の顔に相当する領域としての速度を評価するので、画像中の人物の顔に相当する領域が高速領域又は低速領域に偏在している場合にも、人物の顔に相当する領域を高精度に判定できる、という優れた効果を得る。

【0123】請求項2記載の発明は、請求項1の発明において、顔検出域内の速度が第1の閾値以上の場合に、画像を3段階以上の速度域の領域に分割したときの各速度域の領域の面積比、及び画像上で顔検出域の周囲に存在する領域内における速度分布の低速側への傾度合いの少なくとも一方も考慮して顔検出域を評価するので、上記効果に加え、逆光シーンを表す画像中に存在する人物の顔に相当する領域を、より高精度に判定

することができ、という効果を得る。

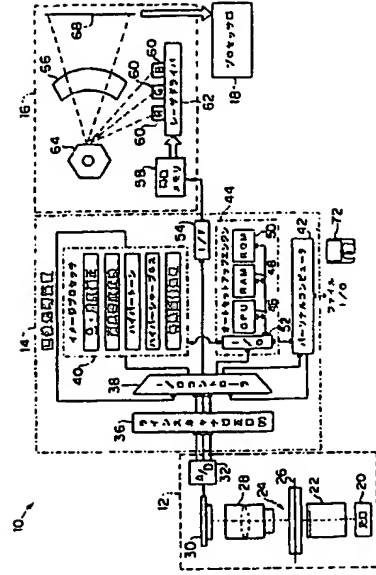
【0124】請求項3記載の発明は、請求項1の発明において、顔検出域内の速度が第2の閾値以下の場合に、画像上で顔検出域の周囲に存在する領域内における速度分布の高速側への傾度合いも考慮して顔検出域を評価するので、上記効果に加え、ストロボを発生させたシーンを表す画像中に存在する人物の顔に相当する領域を、より高精度に判定することができ、という効果を得る。

【0125】請求項5記載の発明は、画像中の人物の顔に相当すると推定される顔検出域を抽出する第1のステップ、顔検出域内の速度が第1の閾値以上又は第2の閾値以下の場合に、顔検出域を基準として判定した人物の顔に相当する領域が存在しているとして判定される範囲内における顔検出域との速度差が所定値以下の場合に、顔検出域内及び人物の顔に相当する領域の有無、又は顔検出域内における速度又は速度のコントラストに基づいて、顔検出域の人物の顔に相当する領域としての速度を評価する第2のステップを含む処理をコンピュータに実行させるためのプログラムを記録した記憶媒体に記録したので、画像中の人物の顔に相当する領域の速度が低速領域又は低速領域に偏在している場合にも、人物の顔に相当する領域を高精度に判定できる、という優れた効果を得る。

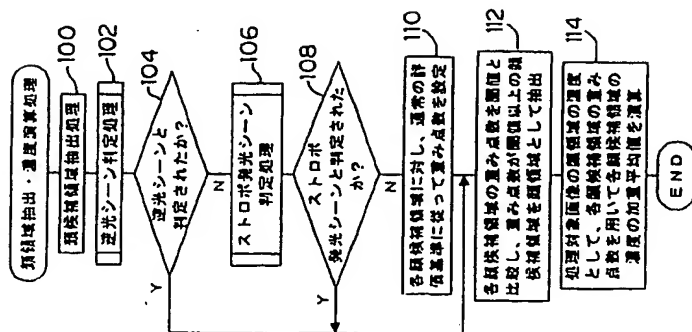
【図面の簡単な説明】

【図1】本実施形態に係る画像処理システムの概略構成図である。

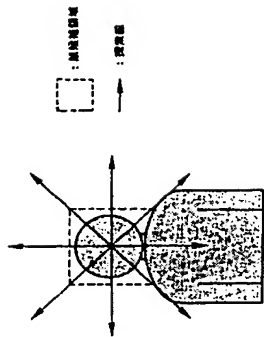
(10)



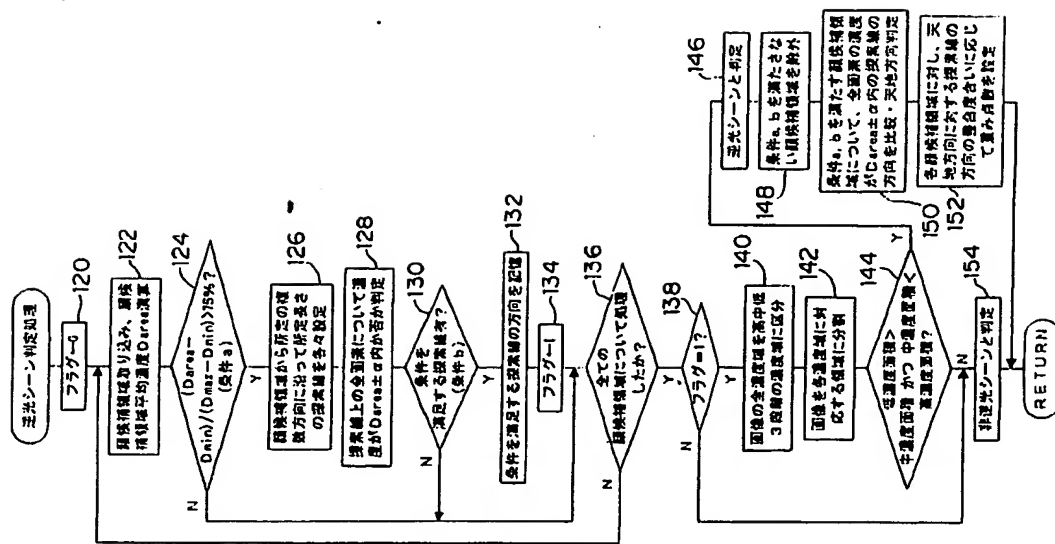
【図2】



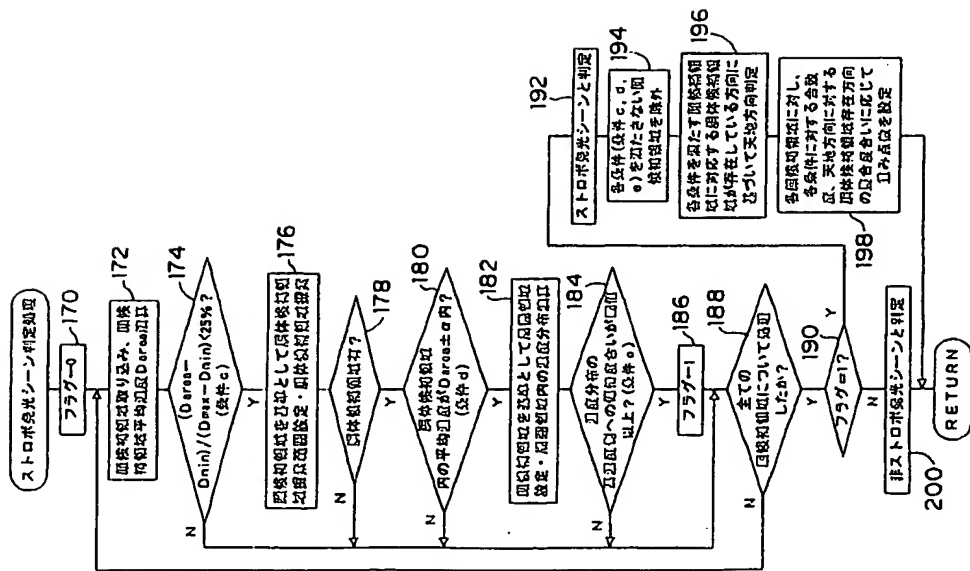
【図5】



【図3】

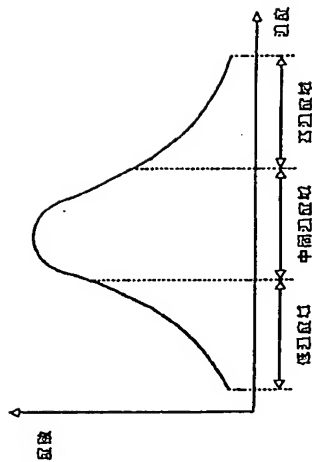


【図1】

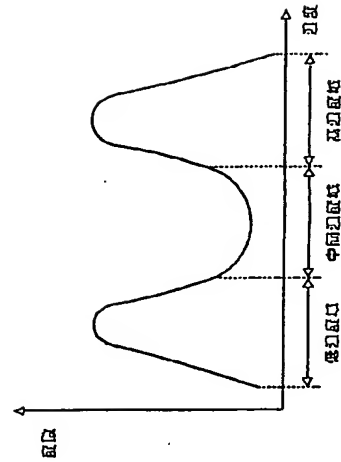


【図6】

(A) 通常の面長の刃幅分布(刃幅ヒストグラム)

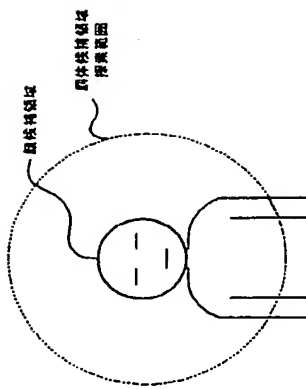


(B) 逆光シーンの面長の刃幅分布(刃幅ヒストグラム)

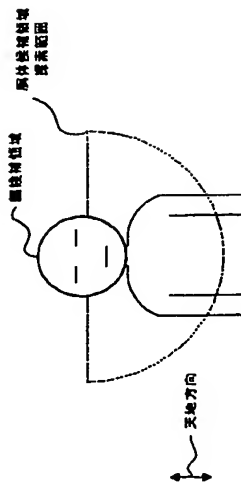


【図7】

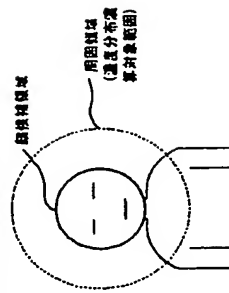
(A) 天地方向が未知の場合の固体候補領域探索範囲



(B) 天地方向が既知の場合の固体候補領域探索範囲

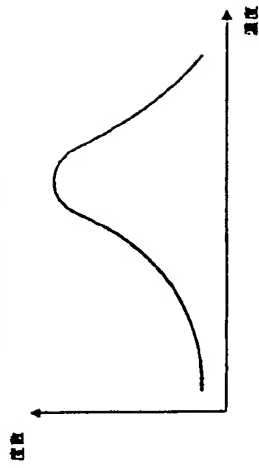


(C) 速度分布履歴対象の範囲探索

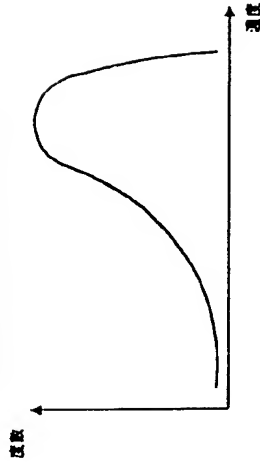


【図8】

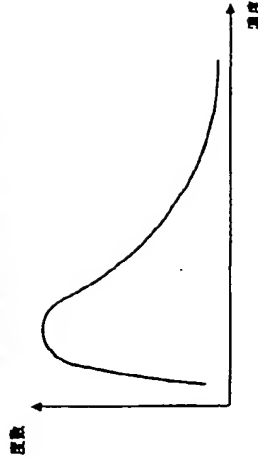
(A) 通常の画像における背景領域の速度分布(速度ヒストグラム)



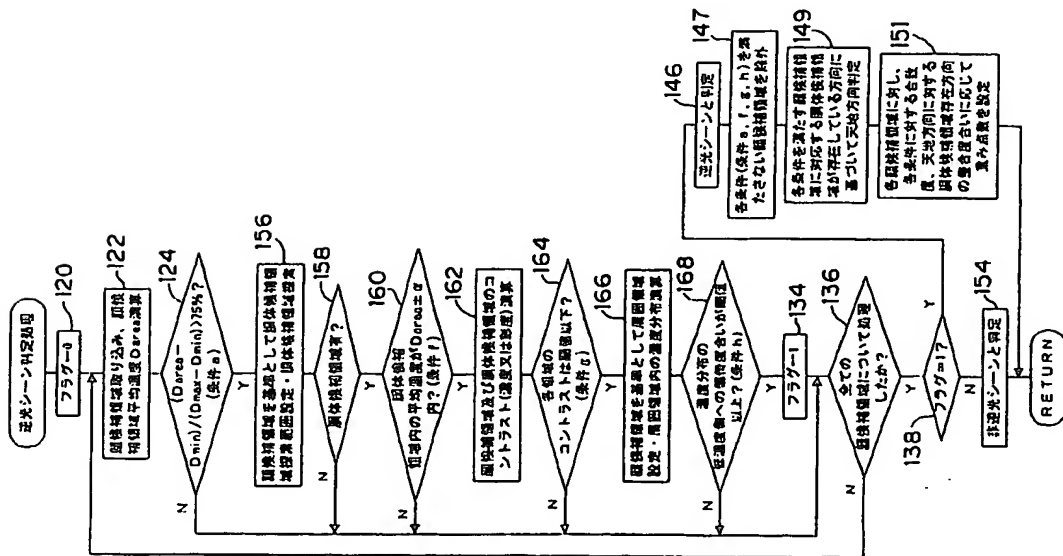
(B) ストロボ発光シーンの画像における背景領域の速度分布(速度ヒストグラム)



(C) 逆光シーンの画像における背景領域の速度分布(速度ヒストグラム)



【図9】



【図10】

